

Forrester
Vol. 11-2-49

Sierra Club Bulletin

VOLUME 34

JUNE, 1949

NUMBER 6

CONTENTS

ON A WILDERNESS TRAIL	Charlotte E. Mauk	1
SIERRA SHORELINES (sixteen photographs)	Cedric Wright	14
COLONEL BENSON, ROVER	Harold C. Bradley	15
HAVE YOU A MOUNTAIN WIDOW IN YOUR HOME?	Elizabeth S. Cowles	17
OH, FOR THE LIFE OF A PACKER!	Norman B. ("Ike") Livermore, Jr.	22
LIGHTNING AND THE MOUNTAIN	James R. Wilson and Robin Hansen	27
ROADS IN THE NATIONAL PARKS	Harold C. Bradley and David R. Brower	31
SIERRA SNOWS—PAST AND FUTURE	Weldon F. Heald	55
STILL A BUGABOO	Robin Hansen	68
THE ECHO LAKE AVALANCHES	Richard M. Leonard	74
ANCIENT LANDSCAPES	Richard M. Leonard	82
A CHILDREN'S BURRO TRIP	Helen and Alfred Dole	87
THE EXPLORATION AND FIRST ASCENTS OF MOUNT MCKINLEY	Francis P. Farquhar	95
MATTHES CREST	Reid V. Moran	110
WINTER SPORTS POSSIBILITIES IN MINERAL KING	Lewis F. Clark	112
WILL THE SIERRA BIGHORN SURVIVE?	Arthur H. Blake	119
EXPANSION ANCHORS FOR USE IN ROCK CLIMBING	Charles Wilts	123
SEEN FROM A SADDLE	Ardath Dietrich	131
ORGANIZATION OF THE SIERRA CLUB		139
REPORTS		140
MOUNTAINEERING NOTES		144
REVIEWS		151

THIRTY-TWO PAGES OF PLATES AND ONE COLOR FRONTISPIECE

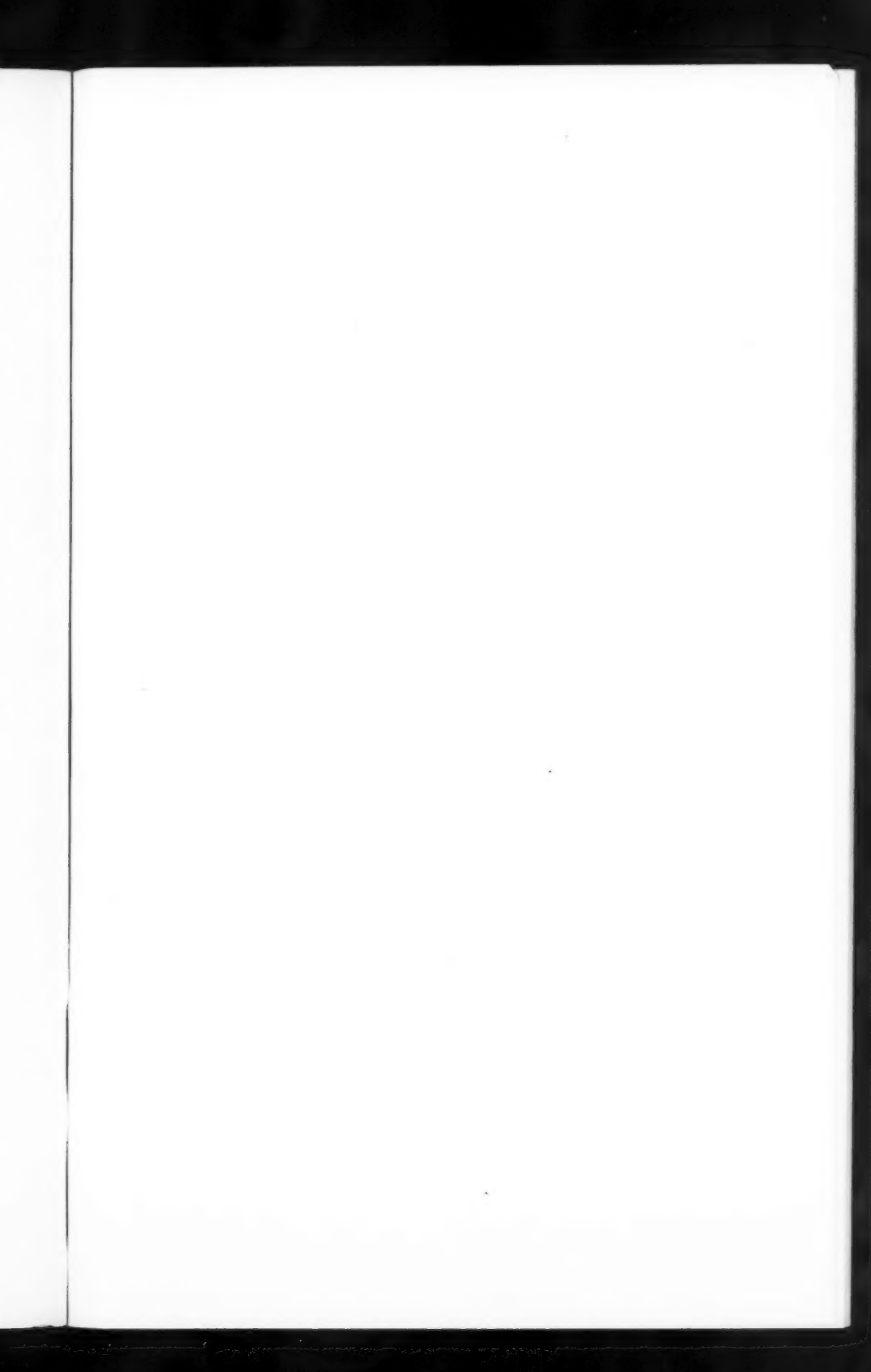
Published monthly except August by the Sierra Club, 2061 Center Street, Berkeley 4, California. Annual dues, \$6 (first year \$12), of which \$1 (nonmembers, \$2) is for subscription to Sierra Club Bulletin. Entered as second-class matter at Post Office, Berkeley, under Act of March 3, 1879. Changes of address should go to address above; communications on matters of club policy should be addressed to the Secretary, 1050 Mills Tower, San Francisco 4.

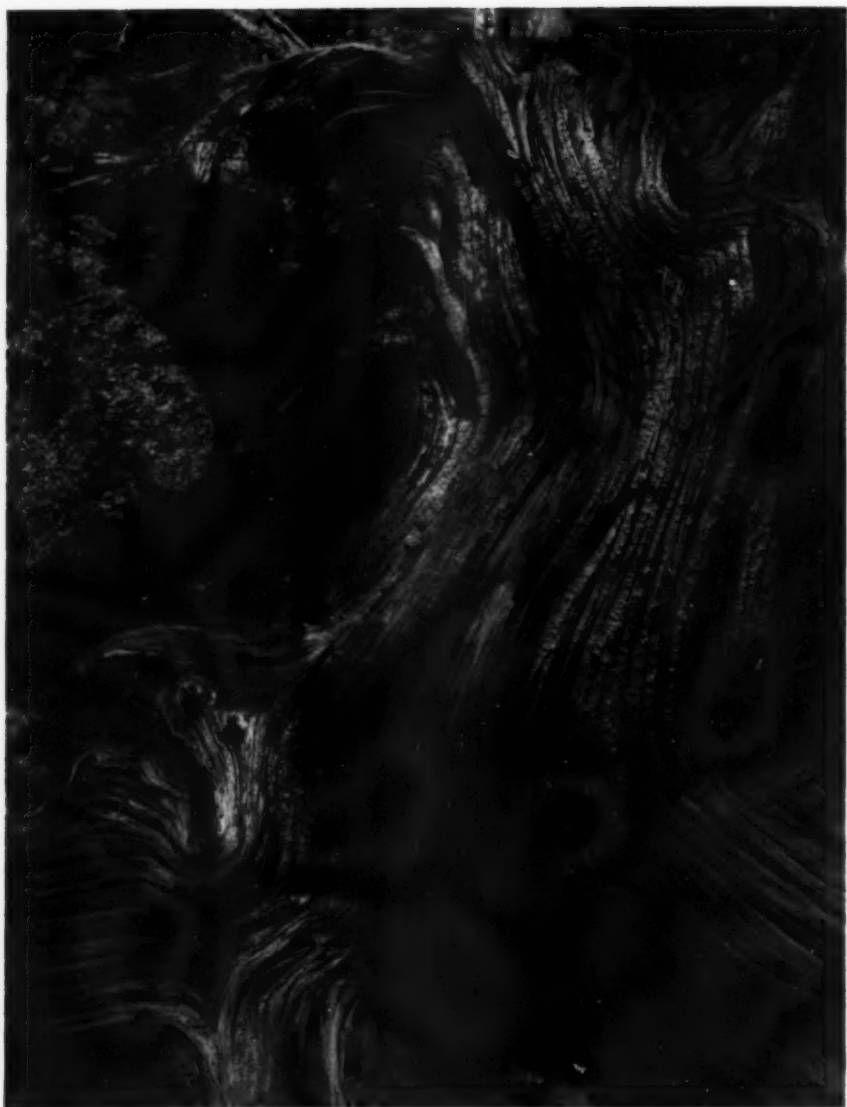
SIERRA CLUB EDITORIAL BOARD

DAVID R. BROWER, *Chairman, and Editor of the Sierra Club Bulletin*;
HARRIET T. PARSONS, *Associate Editor*; ANSEL ADAMS, JOHN R. BARNARD,
BARBARA N. BEDAYN, ARTHUR H. BLAKE, JOAN D. CLARK, AUGUST FRUGÉ,
MORGAN HARRIS, WELDON F. HEALD, CHARLOTTE E. MAUK, MARION R.
PARSONS, VIVIAN SCHAGEN, BLANCHE STALLINGS.

Copyright, 1940, by the Sierra Club

Printed in the United States of America by James J. Gillick & Co.





ALBICAULIS DETAIL

Ektachrome by William Hail

Sierra Club Bulletin



VOLUME 34

JUNE, 1949

NUMBER 6

On a Wilderness Trail

By CHARLOTTE E. MAUK

THERE CAME a July morning when a hundred and seventy-three unlike individuals awoke as a strangely unified body and began the first day of a new life. There had been thousands of man-weeks of waiting for this moment, hundreds of man-days of preparation for it, unreckoned man-hours of detailed planning and cross-checking and adjustment, of listing, reconciling, repairing, ordering, packing, shipping, apprehensive rechecking. Now here were the people and their equipment, the commissaryites and the utensils and the food, the packers and their stock. The myriad heterogeneous elements had been gathered together by rail and air and road and trail, and a mysterious alchemy had transmuted them overnight into the integrated components of a High Trip. There were still a few loose joints, to be sure, a few rough places that had to be worn in, perhaps even a nonconformity or two—but the important thing was that the parts had become a whole, and the whole was functioning.

If fingers fumbled as they rolled dunnage, it was from sleepiness rather than from cold, for the night had been mild at this low altitude. Frosty mornings were to come later, after long climbs out of Kings Canyon. It was still almost dark, though, for the rising call on a moving morning is usually timed to the first faint streak above the eastern horizon, and earliest arrivals groping to the breakfast line blinked in the light of the Coleman lanterns under which Commissary worked. Somehow everybody

got dunnage weighed in and stacked it on the growing pile, found breakfast, clattered through dishwashing, gathered up assorted packs and impedimenta, and got under way.

It was only a few hundred paces from the noise and bustle of Commissary to Zumwalt Meadow, serene and quiet in the dawn light. But in the few moments it took to cross the swinging bridge and go a bit upstream, the person who walked alone or with one or two quiet companions could experience the never-failing miracle of wilderness travel: from being part of a human community, anthropocentric and interdependent, he could change to a separate entity, moving through a world scarcely disturbed by man, and himself as detached or as receptive as suited his mood.

Beyond the meadow the trail ran through a small shadowy grove, led from there to some suddenly rocky slopes, came down again to wind along, almost level, now beside the stream and now beneath larger trees. Old-timers walking that trail were kept busy remembering things they didn't realize were forgotten: in the meadow, the fragrance of roses and dew-sweet grass; in the grove, the gentle wariness of deer that moved away from the trail; at the foot of the talus, the delicacy of plants in small rocky recesses, the bold grace of sugar pines standing tall before the cliffs; along the stream, the powerful curves of standing waves, the green luminosity of deep pools, the mirrorlike slicks over round submerged boulders. There were a few open sandy flats, across which rising sun already shone into the eyes of those who had lingered too long in camp or in the meadow, then a dim-lighted way beneath heavy-trunked trees, and eventually the crossing where one could stand on a massive log bridge and watch the Kings River gliding and dancing and flashing in the sunlight between overarching green boughs. There were some marshy flower gardens, full of bright green light and a warm, musky scent of rich earth, and suddenly the trail was no longer meandering along a valley floor, but was climbing steeply up sunny, rocky slopes.

Heat and dust and unaccustomed exertion alternated with shady interludes through aspen groves or spray-cooled rests beside the stream. Luncheon parties gathered here and there, billycan fires were kindled and tea was brewed, fishermen added their supplements to the bounty of bannanas, gossip and anecdote and advice were exchanged. While they rested, newcomers wondered privately what they had let themselves in for, oldtimers gingerly felt of tired muscles or tender heels when they thought nobody was looking, and reassured themselves that the first day always seemed harder than any that followed.

Maps were spread out, and the uninitiated watched and listened eagerly

as old experts pored over the mysterious brown and blue lines and said, "Well, we must be about here" (holding the place with a finger), "and if this is where camp is to be" (pointing with a twig) "then we must have about—hm-m-m-m—about five miles more to go." "But we couldn't!" somebody exclaimed, aghast. "Why, Dave only said we had nine miles to go, and I'm *sure* we've come at least six already."

Right after lunch, things seemed pretty easy for a while; however, as the effects of the food wore off, first-day fatigue steepened and roughened the trail, and the five miles that must have been only three felt more like eight. All along the route, resolutions were being made to get more exercise before the start of *next* year's trip. But, miraculously enough, nobody did drop in his tracks, and eventually the last ones came into camp, where the transplanted commissary was as bustling and seemingly as chaotic as ever, and there was scarcely time to prepare a bedsite, wash off the worst of the day's grime, and get some extra warm clothing on, before dinner was ready.

Campfire was in a shallow amphitheater backed by dark masses of forest. There had been an indefinable change, in the last twenty-four hours—even in the last twelve—in the people circled around it. Down at the Zumwalt Meadow camp, the night before, they had gathered around a fire, listened to announcements, sung a few songs, and had heard good talks by Sierra Club President Francis Farquhar and Park Superintendent Eivind Scoyen (both of whom had come to see the trip started off properly), and by Park Service Biologist Lowell Sumner (who was to accompany the trip for one too-brief week). But last night the gathering around the campfire had been just a lot of oddly assorted people who had strolled in a mile from their parked cars, had been greeted, labeled, and fed, but still had to become a group. By tonight something had happened. This was the High Trip, it was well on its way, everybody knew he was a part of it, and the irregular circle around the fire was a unit whose individuals now shared common experience.

The tall young leader stood forward in the firelight, making a few necessary announcements and giving humorously phrased admonitions. If newcomers wondered that a man so youthful in appearance could speak with such quiet authority, it was because they did not know his background: already more years of mountain experience and leadership—summer and winter, in peace and in combat—than might be crowded into a score of ordinary lifetimes. There was much they could learn from him in the coming weeks.

The firelight brightened as fresh fuel was added, and singing and enter-

tainment went on—but not for long. Bedsites under pines and cedars were inviting, and mountain peace was already bringing easy repose, even to the overwrought.

The next day was a layover, and gave everybody a chance to appraise both geographic and human environment. The ambitious left camp early to explore or fish or photograph or botanize. Many others stayed nearer camp, where the activities were almost as varied as the participants.

Packers rounded up and saddled stock, and several pack strings went down to Cedar Grove to "bring up the cache." Economy—of grazing and of funds—does not permit the use of enough animals to move both dunnage and food stores at the same time, and packers and mules nearly always work during layovers. (Here, indeed, they had been working even before the trip began, hauling in hay ahead of time so as to spare the little grazing left in this popular and easily accessible spot.)

Laundry began to blossom on bough and boulder, and "May I use that bucket next?" became a popular greeting.

Dave Brower, wielding a shovel, launched a map-reading course by turning his charges into mapmakers; in due time the miniature landscape that he had constructed for his newly contour-conscious class was represented—mountains, valleys, lake and streams—in highly individual but reasonably recognizable maps.

Commissaryites drew their first deep breaths and began to evaluate the individual and collective traits of this year's "public." Some of the public, at the same time, began to evaluate Commissary and the other guests. It is usually within the first few days of an outing that a newcomer makes a profound discovery: democracy may well reach its highest expression on a High Trip, where bankers and bakers, plumbers and poets, teachers and taught, are garbed alike in rough clothes and dusty boots, where whatever caste is discernible at sea level has no bearing on susceptibility to sunburn, fatigue, hunger, or blisters, where the conduct of the individual directly affects the welfare of the group, and where the only aristocracy is that of service.

It was a refreshed and reasonably acclimated group that took eagerly to the trail early the next morning. A varied and beautiful trail, it offers, probably, as many different kinds of scenery as are to be found in an easy day's foot travel. First there is the site of the camp at the upper end of Paradise Valley, with the stream tumbling and swirling through a deep-shadowed coniferous forest that has the peculiar property of echoing some sounds while swallowing others. The trail ducks down suddenly to cross

the Kings River, then runs for a while under a canopy of translucent green. When we start up a brief rocky climb, between sparse pines and thick-growing manzanitas, we are high enough to look back across the groves to the high wall of the Muro Blanco, at whose foot the Kings River comes foaming unseen down its rocky, brush-choked gorge. Here, on the trail, we are following up Woods Creek, a tributary of the Kings. The route tops a moraine and levels off, the valley widens out, and the trail becomes a moist black line across a lush, shooting-starred meadow framed in aspens. Far above the head of the valley, shimmering in the distant light, are sculptured canyons leading off, mysterious and compelling, into steep-walled recesses. There is another forest passage, warmer now as the sun swings higher, and again aspen groves and swampy stretches, marking the junction of the two forks of Woods Creek.

We may notice that the groves here have an unusual appearance—there is a level definite line, perhaps four feet above the ground, below which branches and trunks are leafless and naked, and the forest floor is scoured clear of browse. What has happened to the predators, those agents of natural selection that should have kept the deer population in healthy balance with its food supply? Is it because of man-wrought disturbance that the environment is no longer at its optimum?

From the human viewpoint, however, this is a favorable spot at this moment. Here the combination of shade, water, firewood and midday hunger provide environment and motivation for luncheon parties. Wisps of smoke, drifting snatches of talk and laughter, proclaim little groups gathered around their billy-can fires. From one of the sheltered spots a hail may reach the hiker on the trail: "Will you have some tea with us?" He goes over to the welcoming group, drops his knapsack, settles onto the smoothest available rock or the softest patch of ground, digs into his pack for the lunch bandanna, unties it and spreads it out. If he hasn't stopped too often for brunch, the contents are still varied and plentiful—crackers (or maybe crumbs if the pack has been used for a chair back), sliced meat and cheese, dried fruits, a hunk of chocolate (or maybe a melted brown mass if it has been too close to the sunny side of the pack), a tea bag or two, some sugar cubes. Somebody lifts the precious blackened billy can from the fire, pours from it into the newcomer's cup, and passes around seconds for the earlier arrivals to pour over weakening tea bags (anything after the first draft is still referred to as seconds, even unto the seventh regeneration). Lunch, relaxation, friendly talk, perhaps even some song, work their restorative magic. The leg muscles that were unduly weary on the first day—goodness! Was that only day before yesterday?

—now have a more gratifying recovery quotient. Even so, the little knapsack that seemed light enough this morning has grown heavier, and when the strings of pack animals pass by there is a sudden unformulated gratitude that *they* carry the supplies.

Within what seems only a little while the inexorably shifting shadow patterns have crept far around the tree trunk, and it is time to go on. The billy can is repeatedly filled and emptied, filled and emptied again over the last embers of the fire, the sweaters and maps and cameras and bandannas and odd scraps are stuffed into knapsacks, and another little group makes its way back to the trail and starts the steep climb up out of the canyon. Jeffrey pines, junipers, manzanita and ceanothus, sandy trail and occasional moist garden patches, delicate grasses and showy blossoms, lodgepole pines, singing birds and scampering chipmunks, rocky cliffs, white-barked pines and white, dancing water—all familiar elements of the mountain scene—pass slowly behind and below the travelers. At each pause the backward view shows less of the valley itself, more of the high surrounding peaks. The afternoon sun is hot, yet the patches of shade are too chilling; we are definitely out of the lowlands, and are moving now in the dry, rarefied atmosphere of the high country. Ahead there are jag-sided peaks, bare and austere but bright in color, rising above the last high waves of forest. Up there somewhere, just below timberline, is our next camp.

We are still climbing steadily up the long, rough canyon, now overlooking the wild white stream, now moving through hushed, shaded forest in which bird songs echo lonesomely. Over to the right, a side canyon appears, drops slowly to our level, opens up to show a passageway to Woods Lake. Why! We must be almost up to the altitude of the campsite. Sure enough, we top the climb at last, stroll briefly along the lower end of a shallow meadowy basin, and come to a camp nestled in albicaulis beside a small, tranquil lake. We are ten miles and 3,400 feet from the Paradise Valley camp, and it is a different world. The climbing we have done is climatically equivalent to a trip from Spokane to the Arctic Circle, and within these few hours we have passed through successive bands of plant and animal life reflecting the ever-shortening summers. We look now at the shoulders and heads of peaks instead of at their feet, a new clarity of light and of perception brightens everything we see, and we are ready to agree that the direction to heaven surely must be up.

In the midst of all this splendor, that spatula that Jim is waving must be a magic wand, for he and Ted and Teddie and the rest of the kitchen crew have conjured up a feast that is, in its own way, no less splendid than

the sunset that flames in the sky and burnishes the lake surface. Hot soup and a wonderful steak dinner go a long way to dispel fatigue and evening chill, and when the satisfied diners have climbed up to the campfire site, with its background of miniature cliffs and its distant view across great canyons and ridges, and have settled somewhere in the friendly circle about the twin fires, they have a feeling of well-being that is seldom attained.

The joys of exploring new country do not necessarily surpass the delights of revisiting familiar scenes. Old-time high trippers apparently relish a third or fifth or sixth stay at a favorite campsite as much as the newcomers do. Usually, of course, the High Trip doesn't get around to the same place more often than every five or six or more years. Here, though, we were revisiting a camp that we had also enjoyed in 1946, and the interval was short enough that many memories that might otherwise have dulled or faded were still sharp and clear. There were thirty-four in camp who had been on this part of the trip two years before. Their remembering ran all the way from unconscious recall (how else could they have followed the best route to campfire without thinking about it?) through recognition of familiar details to actual searching for the original of some remembered image.

There was the same view from the campfire ledge, with Mount Clarence King just showing over intervening ridges. There were the brilliant stars, glittering through the albicaulis branches over the same bedsites. There was the same serene curve of lake shore, quiet in the early morning, and with that little tent-shaped peak to westward of it again glowing red in the first sunrise light. There was the dark, massive mountain opposite the camp, its deeply fluted, buttressed sides sweeping down to rim the pair of little lakes. How good to have these things to remember, and to come back and have the pictures made even more vivid! There were the Clarke crows cawing in the same treetops, and the juncos—the same ones?—fluttering up from their nests as we walked too close to certain tiny hollows beside the shore. There was the morning sunshine streaming warm across the plateau and flashing from the same old plates held out for breakfast hotcakes. There was the same commissary setup, almost as though it had never been moved away—the stoves, the folding worktables, the piles of stores in the shady coppices, the serving line, all oriented just as they had been before; the “customers” were passing through the line and then, spreading out over the large open area, balancing well-filled plates and cups as they settled onto the same boulder chairs.

This was a pretty good commissary site. It met important requirements—water, wood, shelter for the food supply, bedsites for the workers, sufficient distance from the general sleeping quarters to spare the guests the sounds of early-morning kitchen activity. Equally important, it had plenty of room, on broad granite slabs and gravelly soil, where first the mules and then the public could mill about without leaving any appreciable evidence that a large party had been there. Here, as in all camps, it was our constant effort to disturb the terrain as little as possible.

The steps taken to achieve that end might astonish the heedless or ignorant camper who, convinced that the wilderness is limitless and inexhaustible, has no scruples against moving into the choicest of sites, hacking at it to suit his every whim, and leaving it trampled and littered. High trippers come to know that camping skill can be measured inversely by the evidence of their habitation, and—particularly in Commissary—has developed techniques for minimizing that evidence. The routine of breaking camp includes gathering and burning trash, liming and covering all pits, burying ashes and charcoal as well as the unburnable garbage, even knocking down and dispersing stonework under the stoves or about any superfluous fireplaces. Ted Grubb and Pat Goldsworthy are particularly experienced in this kind of landscaping, and by the time they and the rest of the crew pulled out of the Twin Lakes campsite, even the garbage pit was concealed with carefully saved squares of sod, and pine needles and rubble had been strewn over the marks of the heaviest commissary traffic.

Almost before we could realize it, the layover at Twin Lakes had come to an end. Through the day little groups had spread widely over the broad sunny uplands, engaged in a variety of pursuits. By mid-afternoon even the kitchen was deserted. A hundred and seventy-three people were swallowed up in the vast quietness of the timberline basin. Once the dinner-time bustle had commenced, however, it didn't take long for the crowd to reassemble. Then there were only the campfire and the brief duration of a cold, sparkling night before it was time to move over Pinchot Pass.

I suppose that almost any of the High Sierra passes may seem to be one of a person's favorites while he is on it. Each has something peculiarly its own—its austere grandeur; its easy intimacy; its challenging ruggedness; the gentleness of the approach to it; the dark, forested quietness of the canyons stretching away below it; the breadth and mystery of the horizons it reveals. Pinchot is one of the easiest—especially when approached from the south—and there is unique charm in the shallow,

flowery basins, with springy turf underfoot and a broad, open sky overhead, across which the trail wanders before climbing up onto the rocky ridge and angling into the cirque whose headwall becomes a gateway at 12,050 feet. The pass was a pleasant place to spend a lunch hour, in sunshine and gentle wind, and with clumps of brilliant polemonium all about us. We were reluctant to go down, even though we knew we would walk beside a series of pretty little lakes, one on each of the successive giant steps left by the glaciers, and that we would then drop down to the forested levels and come to a long, meadowy bench running halfway around a mountain and cupping unsurpassed Bench Lake at its westernmost end.

Through the rest of the trip, of course, we would alternate layovers at delightful campsites with the crossing of other passes, repeating and elaborating the cycle of canyon and upland, climb and descent, with something familiar and something new in each successive day. What were the other passes, the other days of resting between moves?

After two golden days at Bench Lake we dropped down, down a thousand begrudged feet to cross the South Fork of the Kings, and then climbed up the other wall of the steep canyon, up and up until we got to Cartridge Pass (12,040). It had been twelve years since the Sierra Club had crossed Cartridge Pass—and from the appearance of the trail, it could have been twice that long since any work had been done on it. The southern approach was, except for a few spots, easy enough—though tedious, under a hot sun on a shelterless slope—but the descent on the north was something else. It was here that we came within a hair's breadth of tragedy.

All day Bud Steele had been having trouble—as had all the packers, beginning with their difficulty in finding the stock and getting a terribly late start in consequence. Bud had the “kitchen string,” and his end mule, short-legged and excitable, was repeatedly thrown off balance as her bulky side loads (the two nests of giant kettles) struck against the upper bank of the narrow, steep-walled trail. Twice already she had rolled. Now, despite the precipitous descent and the insecure footing, most of the strings had already got safely down to the broad meadows below, and Bud had his string well down toward the bottom. Here the talus is practically at the angle of repose, and even the trail itself is scarcely more stable than the great blocks between which it threads. Bud paused and looked back to see how his animals were faring. The string of five, roped together, was zigzagged above him, seemingly straight up above his saddle horse. At that moment the end mule knocked herself off balance and began to roll. Bud envisioned the whole string coming

down on top of him, and leapt from the saddle. But as he hit the rocks he missed his footing and tumbled down, head over heels. Perhaps seventy-five feet below was a snowbank, and there, fortunately, he stopped. It probably saved his life. Other packers rushed down and found him shaken and battered, but they got him on his horse again, then eased his string and their own animals down the rest of the treacherous pitch, and eventually got all of them into camp. There the doctor marveled that Bud had escaped with nothing worse than bruises and strains, and Commissary and a host of helpful volunteers turned to setting up the kitchen and preparing a belated dinner.

Marion Lake was so lovely that nobody minded staying for an unscheduled layover while Ike Livermore went ahead to scout the trail down the canyon, Dave Brower, Bill Hail, and Jim Harkins looked over the nearer part of the cross-country route (via Red and White passes) by which the Sierra Club party had crossed from Horseshoe Lakes in 1936, Bud began to recuperate, and a skillful old-timer restored the badly deformed kettles to their proper cylindrical form.

Ike's findings were encouraging, and on the next day we went down to Simpson Meadows. But the meadows there, too heavily used, have suffered the same fate as many another—once a flowering garden, now overgrazed and weedy. It was so oppressively hot and dusty there that we fled up the trail as soon as it was light on the following morning, and climbed all day until we reached a charming little bench high up under Granite Pass. With rock gardens in the foreground and the rugged crests of the Evolution country as a distant backdrop, it was a perfect setting for the Bandanna Show, Art Exhibit, and social tea. One day spent here was much too short, but the schedule decreed that we be at the road end the next night. Morning found us climbing briefly to Granite Pass and then slogging down the six thousand feet to Zumwalt Meadow. How glad we were, as we descended the parching trail, that we had not been obliged to start our trip by climbing it!

Having exchanged two-weekers, received mail and fresh supplies, and entertained visitors, we started again up the Kings River; this time, though, we turned right and then right again, up Bubbs and Sphinx creeks, and came to an old campsite among lupines and aspens where the trail crosses Sphinx Creek. While newcomers caught their breath, packers pushed the cache ahead, and climbers (and observers) spent a profitable day on (or near) The Sphinx; then we crossed Avalanche Pass—only 10,000 feet and scarcely noteworthy except for the unusually fine stand of foxtail pines—and moved into Cloud Canyon. Here, appropriately

enough, we had the one rainstorm of the entire trip. It lasted only long enough to give everybody a taste of scurrying and tent-pitching and to leave the land moist and sweet-smelling, and the tip of The Whaleback emerged from wreathing gray mists just in time to catch warm sunset light.

During the usual layover day several strings made a round trip across Colby Pass to place a cache on the Kern-Kaweah. When we followed, a hardy group led by Army Armstrong, feeling, perhaps, that the 12,000-foot pass would be too tame, chose to cross over by way of the summit of Triple Divide Peak. The main party had more excitement than they wanted, though. A mule fell from the trail just below the summit and was killed, and an enormous granite block that was loosened at the same time went bounding down the mountainside, pulverizing stones every time it bounced, and threatening everybody on the trail below. Unable to see what was happening but warned by startled shouts, those still on the switchbacks managed to run across the face of the slope and escape the hurtling boulder. Ike eventually got the rest of his charges over the pass without further mishap, but the loss of the mule—the first such accident he had ever had—was depressing as well as frightening. Each hiker must have had thoughts of gratitude for his safety as he followed the down trail, much less rough on the south side, winding through exceptionally beautiful beds of primrose. Down at the stream on which we were to camp, the management was somewhat dismayed to find that the food cache had been laid about three quarters of a mile *upstream* from a certain reference point, instead of an equal distance below, but a midway compromise was satisfactory for everybody but the poor workers who had to get dinner materials from the distant larder. However, the view of the magnificently sculptured Kaweahs at the head of the meadowed canyon was compensation for almost anything.

A long move down the Kern-Kaweah and up the Kern brought us to a beautiful camp in Milestone Basin, and two perfect days there were fitting prelude to the grandeur of Foresters Pass, 13,200 feet. The excellently engineered approach to the pass, the beds of polemonium at the summit and far down toward the headwaters of Bubbs Creek and the meadowy camp that was our destination at the foot of Center Peak made this an outstanding day. In addition, we were greeted and feted by friends from Base Camp, comfortably established some four miles below our site. Oliver Kehrlein promised us a second breakfast as we passed through Base Camp the next day, and the feast his commissary turned out for us—fresh peaches, genuine eggs out of shells, and fresh-baked cinnamon rolls—was truly impressive.

We had crossed our last pass, now, but the camp at East Lake, where we stayed for the final two nights of the trip, was so lovely that it was not anticlimactic after all. We were rejoined here by a group that had knapsacked over from Milestone by way of Harrison Pass and Reflection Lake; they were glad to see the commissary strings coming in, since some of their carefully planned and segregated food packages had turned out not to be in anybody's pack.

Last-day activities included just about everything—sunrise photography at Reflection Lake, an ascent of Mount Brewer, laundering and mending in preparation for the morrow's return to civilization, the traditional bandanna show, and an entirely new carnival feature, a mule's beauty contest that also involved some rodeo events.

If campers stayed late at the fire that night, it was because they knew that tomorrow's long downhill trip would only take them back to tensions and complications they had managed to escape for two or four weeks. They preferred, right then, to stare into the flames and think back instead of ahead—to fix more firmly the memory of days such as those at Bench Lake or at Milestone.

"Bench," "lake"—neither word by itself has any magic connotation. But together, as a place name, they designate a very special expression of high-mountain beauty. Somehow, this particular campsite is more than just a lake with forest and mountains around it. There are other lakes that mirror the morning stillness and on which afternoon wavelets flash in the sun and murmur and chuckle against shoreline rocks. There are other stands of *albicaulis*, fragrant and picturesque, that embellish rocky points and shelter charming bedsites. There are other uplands where broad, open landscapes lie warm and peaceful under a wide sunny sky, where wind moves softly through the trees, where bird song emphasizes the serenity. There are other places where fish can be caught, flower-bright rock gardens can be photographed, mountains can be climbed. But there is no other Bench Lake. Here alone are these elements of mountain landscape so exquisitely blended, each enhancing the other in such perfect balance that not even in retrospect can one pick out any feature and say "That was outstanding." For some of the campers, though, the most cherished memory will be an afternoon spent at the very tip of the longest peninsula, in a little open space warmed in the sun, scented with the resinous perfume of *albicaulis*. Here, in utter tranquility, friends met for tea and talk, and presently Ollo Baldauf sang. Simple songs, mostly folk music, with their sincerity and directness enhanced by her rich voice and

the simple guitar accompaniment, they were in this setting peculiarly appropriate and profoundly affecting.

Something of the same tranquility was a feature of the camp on Milestone Creek. Here, too, was high open land with a broad horizon. Almost a mile above the usual Milestone campsite, we were in a wide basin, rocky and rugged, but with gardened patches and bits of meadow all along the stream and on the little benches, and the sunlight and clean sparkle and peacefulness seemed as tangible as the granite we walked on and the trees we camped under. From this camp we could look out across the deep canyon of the Kern and up to the very culmination of the Sierra—there, to the southeast, was Mount Whitney, with spiry Russell beside it, silhouetted against the sky. The evening of our arrival we watched a rare sunset effect, when the eastern sky, cloudless but faintly misty, glowed a strange blue just above the horizon, blending, higher, into a bank of pinkish lavender.

Next morning's early sun shone on a camp of happy people. There were to be two full days here, and yet a week would not have been long enough to savor all the delight of this camp. Of course there were climbs of Milestone Mountain and Table Mountain, or trips of exploration into the heads of the surrounding high, rocky basins. Many, though—especially those who had come over from Kern-Kaweah by way of Milestone Bowl—were content to stay restfully near camp, enjoying the gentle charm of tiny meadow and garden spots or shady, tree-sheltered nooks.

The transportation department, in particular, seemed happy to relax. For once it was not necessary to go back to bring up a cache, or to move one ahead; a few strings had doubled back, the evening before, to pick up what had been placed beforehand on the Kern. It had been a strenuous day for the stock, though—and not without resultant brief strain for Commissary. Because of the extreme roughness of the trail, the packers had untied their strings when it got dark, counting on all the mules to follow successfully. In the confusion of the late return, with everybody helping to unload everybody else's animals, nobody noticed that not all the mules were in. There was great astonishment at breakfast time next morning when a fully loaded mule trotted through camp, bound for an eager reunion with his fellows. Even when he had been caught and unloaded, a quick check disclosed that one more was unaccounted for—and so were the most precious ingredients of two future dinners. But before anybody had to catch a horse and ride out to search, a friendly camper from downstream had brought in the missing mule, with load still intact. This was probably the mule later found reclining on an air mattress.

An important part of Milestone memories is the lakelet, not far above the Kern, that we passed on our way over to Tyndall Creek headwaters. Lying at the foot of an ungrazed, undisturbed meadow, flanked by sun-flooded trees, a perfect mirror for the low granite cliffs beside it, it is a telling revelation of remoteness and peace, an essential part of that which we seek in wilderness travel.

Let's stay at campfire a while longer and share the review of other remembered pictures. They are all different, yet how alike! Of course. Here are the same elements throughout: granite, carved and polished by glaciers of past centuries, warmed in today's sun; water, quiet in a serene lake or dancing and singing between garden-bordered banks; trees, rough-barked, fragrant, often fantastic in shape, still fascinating as twisted, textured abstractions even after sap and leaves and bark are gone; gardens and meadows, delightfully framed, and filled with delicate beauty; high, wind-swept ridges, looking out to ragged, blue-hazed horizons; sunlight, illuminating and enhancing every charming color and form and motion; remoteness and naturalness, undisturbed by mechanization. Here we can add companionship, bringing warmth and enlightenment to every experience. Surely the essence of mountain wilderness is in such elements as these, and the people who cherish them have enriched all their days, high-land or lowland, forever.

Sierra Shorelines

CEDRIC WRIGHT's photography needs no introduction here. Readers of the *Bulletin* know it well. We do feel, however, that we have never come closer to suggesting the excellence of his prints than in the sixteen pages which follow.

As for the Sierra shorelines—and the term is used in a rather unusually broad sense—let Wright's photographic interpretation speak. And may the best of these wild-land streamside and lakeside scenes long remain untamed!

- | | |
|--------------------------------|---------------------------|
| 1. Bear Creek | 9. Bench Lake |
| 2. To Mount Clarence King | 10. To Split Mountain |
| 3. Stream detail | 11. Bench Lake |
| 4. The Kings above Muro Blanco | 12. South of Pinchot Pass |
| 5. Meadow and cloud | 13. South of Silver Pass |
| 6. Near Bench Lake | 14. Arrow Peak, dawn |
| 7. Leaping water | 15. Arrow Peak, morning |
| 8. Bench Lake | 16. The Minarets |

The 150-screen copper halftones are by the California Art and Engraving Company, Berkeley. Letterpress, varnished, by the Gillick Press, Berkeley.



Sierra Shorelines

Photographs by Cedric Wright































Colonel Benson—Rover

By HAROLD C. BRADLEY

IN THE SUMMER of 1905 I was chaperoning three young Yale men on their first pack-horse trip in the Sierra. We had picked up our stock at Sonora and had come in to the Valley via the Clavey, Lake Eleanor, Hetch Hetchy and the Big Oak Flat road. We had camped in Little Yosemite for a few days to fish and to climb Half Dome, and finally were up in Indian Canyon making noon camp beside a little patch of meadow en route to Tuolumne Meadows. Suddenly we heard the clatter of a horse coming down the trail from the north, and here came a tall cavalry officer afoot and on the run, leading his mount. When he saw us, he trotted over to the meadow and threw off the saddle and bridle and came over to our camp. "How are you, boys," was his friendly greeting. "I am Colonel Benson. Can you let me have a cup of your tea?" We welcomed him, of course, introduced ourselves, and shared with him our lunch of hardtack, raisins, and tea. He was genial and easy to talk to, interested in our trip and in our plans for visiting Tuolumne Meadows and the high country. He gave us some good tips on the trail and where to find feed. He seemed to know every camping spot along the trail. He noted our equipment, complimented us on the general condition of our camp, and added a friendly word about fire hazards as though he were personally enlisting our help in his problem of preventing fires.

"How far have you come this morning, Colonel?"

"Tioga Pass. There's a big herd of sheep just over the boundary. I had to warn the herders not to drift them over the line."

"That's about thirty-five miles! You must be tired—and your horse."

"Oh no. I'll be in Wawona tonight. My men have brought in a couple of herders for trespassing on the park and I'll be there to hear the story."

He went on to tell us of his battle with the sheep men. He kept on the move with relays of fresh horses at convenient points where detachments were camped. In the valley he would pick up a fresh mount and ride to Wawona in the cool of the afternoon. He could cover the Park from north to south boundary in a day—seventy miles of rough going. He had to keep his eye especially on the north and east boundaries at this season of the year, because the sheep were edging in close, and would slip over the line when it was thought the coast was clear. He suggested that we might like some fresh mutton on the hoof, if he found

the flock in Tioga Pass when he got back. He had us all completely won and eager to fight for the park with him by the time he had finished his lunch. He carefully curried his horse before he threw on the saddle. "I'll be seeing you again," he commented as he swung up.

Some weeks later we were camped along Dog Creek in the Meadows, when the Colonel galloped toward our camp on his way to Tioga, letting his horse out on the old Tioga road across the level meadow floor. He had spotted the blue haze of our smoke among the lodgepoles and dropped in for another visit and to rest his mount. He made it a practice to stop, unsaddle or at least loosen the girths, and give his horse a rest while getting acquainted with the campers. He knew us at once, and all about us—even our names and where we had planned to travel. He was full of keen questions about what we had seen, the condition of trails and the feed. Twice more that summer he breezed in on us—always unexpectedly. And our camps improved as we went along.

No Superintendent today could possibly cover his park as Colonel Benson did in 1905. The administrative detail has increased enormously since then and the officer responsible must be at Headquarters continuously during the peak of the season, when there may be as many as thirty-five thousand visitors in the valley, and emergency decisions have to be made on the instant. But as an effective method of keeping track of the vast hinterland of the park, Benson's was a way hard to beat.

A couple of young, hard-trained college boys, selected carefully, commissioned and briefed as roving rangers during the summer, would do much to lessen the danger of fire, of untidy camps, of general sloppy mountaineering, with the deterioration of the virgin scene which results. It might do much to solve such problems as the Rancheria Mountain fire and the cluttered camps that confront the Park Service in its rush season today. These young men would be chosen for their mountaineering competence and their personalities. They would be emissaries of good will, rather than police. They would know who was camping in a given region; where they were from and where they were going. They would give detailed trail and camp information to those who might need it. The very fact that a ranger might drop in at any moment would be a great stimulus to good camping and good manners in the park. For the Chief Ranger and the Superintendent, they would be a valuable intelligence service without any of the obvious and unpleasant features of park police. By their activity and competence they would command respect. By their genuinely friendly attitude they would make understanding park friends, and campers eager to preserve as well as to enjoy.

Have You a Mountain Widow in Your Home?

By ELIZABETH S. COWLES

I REALLY hate to set myself up as a critic of the opposite sex. Men have always been among my best friends, especially the mountain-climbing variety. But there is one mistake they make so frequently that I feel impelled to point it out. It has to do with the female of the species and might be entitled: Women in the Mountains.

I'll begin with a story. It isn't a true story in that I never knew a mountaineer named Don, let alone one who was married to a girl named Alice. But it may illustrate the point I want to make as well as some of the true stories I do know. I had met Don in the Tetons, we'll say. He attached himself to our climbing brotherhood and we had some fine times in the hills. He did his part on the mountain and his part in camp and added to everybody's good time with an inexhaustible fund of vitality and good humor. None of us thought of him as having a wife. She wasn't around. She was back in Little Rock, it turned out, waiting patiently for Don to come home.

Don't jump to the conclusion that Don and Alice were unhappily married because they weren't. She was a perfect dear and they were devoted to each other. Nor was Alice, as you might think, the fragile type, not rugged enough for the great outdoors. On the contrary, she had always been something of an athlete. In fact, as Don confided to me later, it was seeing her outplay and outlast an opponent in a tennis tournament five years before that had first bowled him over. The truth was, though I was some time in finding it out, that Alice was just the kind of person for the mountains, as Don obviously was, but somehow they'd never succeeded in getting together about it. Why?

It's a long story but I think I'll tell it. It all went back to the honeymoon. Don had thought it would be fine to take Alice climbing. There was a certain amount of understandable masculine vanity about it. He had watched her shine on the tennis court—it was going to be nice to have her see him do his stuff on a rock wall. And that she would take to climbing like a duck to water he hadn't the faintest doubt. I think Don fully expected Alice to swarm up her first chimney like a human fly!

Sad to relate, things didn't turn out quite that way.

It was a funny thing: with anyone else but his new wife Don would probably have known better than to go at their first undertaking as if

en route to a fire. But this time he just got carried away. Having a well developed set of climbing muscles himself, it apparently never crossed his mind that training is something a sea-level spouse acquires slowly. Nor did it occur to him, carrying eighty pounds himself, that a twenty-five pound pack might be a bit heavy for a beginner. And what a shame it was about her blisters! Those new boots should have had an easier breaking in. (So should Alice.) Bad luck hounded them, too, in that five days of solid rain followed their installation in camp and she caught a fearful cold. It was a hideous combination of the preventable and the unpreventable, like most human disasters. But that wasn't all.

Don made his next mistake when finally the sun came out. He rushed Alice off to a favorite cliff of his. Lost in his own delight at being back among the familiar cracks and ledges, he failed entirely to notice that Alice, to whom such maneuvers were new, was having the living daylight scared out of her. Mind you, she behaved very well. She was a good sport about everything and tried her darndest. But the will-to-do, unfortunately, is not always enough. The harder she tried the worse things got and finally her weariness and fright were only exceeded by the appalling depths of her sense of failure. It was quite a while before Don, his head in the clouds, noticed how slow and unaccountably awkward she was and that she didn't seem to be enjoying herself at all. He was surprised at first, then tenderly amused. But when matters failed to improve, his feeling changed to one of very real disappointment and chagrin. Poor Don, he had pictured it all so differently! It never occurred to him, then or later, that there was only one person responsible. That was himself.

Things went from bad to worse until—a break for Alice—two Dartmouth classmates turned up in their valley. Don had one super-duper climb with them while Alice stayed in camp. Vacations were short in those war years. Soon our young couple were on their way back to civilization where they took up the threads of a life that proved to be very full and happy. But—and this is the point of the story—*Alice never went climbing again*. And who can blame her?

This fable illustrates an imaginary set of conditions and those, I grant you, may be rather exaggerated. But the general outline of the situation is so often seen as to be relatively common in mountaineering circles. Climbing widows abound. They usually have to choose between waiting around on a hotel porch day after day while Hubby is off exercising in the hills or, worse still, being left out of his vacation plans entirely. All this is a great pity. As everyone knows or should know, the climber is at his very best in the mountains. He is happiest, healthiest, gayest, fun-

niest. What a loss for people to miss this in the one they love! Companionship is a rich part of the climbing experience. Why impoverish married life by failing to share it?

I claim that it needn't be so. If your spouse has the necessary number of hands and feet, general good health and plenty of affection for you, it's just a matter of patience, imagination and a little salesmanship. I don't mean to say that the little woman will necessarily be able to wave an American flag beside you on the summit of K2, but the probabilities are she'll grow to love the mountains and share your joy in wild country if you'll only give her half a chance. And for the rest of your lives you'll have wonderful times in the hills together, to say nothing of the endless fun that will be yours of planning and recalling vacations future and past.

No wands, potions or abracadabra are necessary. It's all quite easy. You just have to obey a few simple rules when first you introduce your lady to the mountaineering scene. What are they?

Rule one is: *Don't let her get tired.*

Take it easy! Gear the proceedings to her strength. Resist the temptation to whip up a steep trail at a three mile an hour clip to start with. Make it a short walk, a gentle grade. Have a fine *Aussichtspunkt** an hour or so out. Eat lunch there (and be sure to tell her how purty she looks against the sky in that red flannel shirt!). Keep your love happy and comfortable while she's gradually working up some hill-going muscles—and don't forget that it will take time. Details mustn't escape you, like seeing that boots fit so as to spare her the painful ordeal of blisters. Be sure she doesn't get a charley-horse, or pick up a terrible sunburn, or suffer unnecessary harassment from black flies or mosquitoes. Just remember (in time) that there are salt pills, lanolin preparations and insect dope available at the nearest drugstore.

When you are established in camp (and you might start her off, by the way, with a pack that is bulky—for her pride—but light) do a few extras so she'll be pleasantly surprised at how nice camping is, right from the beginning. If your dear one is to be cook, why not have given her a little chance to practice camp cookery ahead of time so that her first meal is good and she commences her new career with a sense of success?

That sense of success is, actually, the whole business, the secret of everything. Never forget it for a minute! She must always feel she's doing well, that you are pleased with her and delighted at her progress. If she truly feels this, she *will* do well, she *will* make progress (and you *will* be delighted—no make-believe about it!).

*This is Deutsch for a place from which you get a lovely view.

The importance of this sense-of-success cannot be overemphasized. It is the sine qua non. Remember it especially in relation to the second commandment: *Don't let her get scared.*

Take the real climbing very slowly. Build up her confidence with the greatest care. Try beginning with slab walking, the way the mountain troops do. It does wonders for the sense of balance and your lady-love will be far less inclined to grab and cling later, when the angle increases. On the first steep pitches, the going should be really easy with lots to hold on to. Vary the terrain, of course, and try her out on different types of assignments to keep it interesting. But never dream of undertaking anything at all difficult until she's entirely at home with simple chimneys, slabs and ledges and you're dead certain she's enjoying herself. That's the vital thing to watch out for: is she having a good time? If it continues to be fun for her, then you're a first-rate teacher and your pupil is bound to graduate eventually with honors.

That the advanced lessons in climbing have to be handled very carefully too goes without saying. You mustn't relax for a moment! Beginners shouldn't be asked to accustom themselves to exposure on a rock face, for instance, at the same time that they are learning to make a little go a long way in the line of holds. One lesson at a time, my friend. This goes too for the techniques of snow and ice work, for training in the use of rope and ice ax, and for the many other skills that advanced alpinism requires. If big-league mountaineering is what you enjoy, you'll want your wife to enjoy it too. It's all perfectly possible. But just remember how long it took you to learn the business and don't expect her to be a lot brighter than any one else in the world. Time, practice, patience and affection—combine these and it will surprise you how soon your lady begins to feel the exhilaration of even the most airy maneuvers.

I might throw in a few extra tips here: *You* be the one that seems to be holding *her* back, not vice versa. It will be fine for the general morale. Praise her endlessly. It's wonderful what a compliment does to hearten us girls. And by all you hold dear, do NOT condescend! All will be lost if you sound like Paderewski instructing a first year student of limited talent.

Now let's go on to Commandment three. It is: *Don't let her get bored.*

Set yourself to making camping and climbing a delightful experience. It's poor judgment to stick out a seven-day rain, for instance—how much brighter it would be to take your girl-friend back to the valley where she can get a hot bath and go to the movies for a change. Vary your schedule: don't always be exercising wildly. Have frequent days off. Bring some good books along (the little paper-covered ones don't weigh very much)

and read aloud. Introduce her to mountain photography, or learn about alpine flowers together, or see what the two of you can find out from one of the tiny bird handbooks and a pair of field glasses. A one-track mind in the hills is a fearful mistake. The mountain experience is rich—investigate some of the many and varied fields of interest it offers. You never know what may capture her fancy—and your own.

All this is likely to take some self-discipline to start with and you probably won't achieve many fancy ascents that first year—but I'll be willing to bet a substantial amount that you'll end by considering it one of the best investments you ever made. You'll reap rich rewards; so will she!

So far my remarks have been directed towards the mountaineering man who for some reason has failed to condition his wife in favor of his beloved sport. But now I'd like to put in a brief word to the climbing widow—the one who stays home while her husband is off gallivanting in the Canadian Rockies and who perhaps feels a little sorry for herself at times. Madam, it is not too late—that is, if you *want* to do something about it.

The following story is short; it also happens to be true. It concerns my own sister. In the early years of their married life, her husband used to roar up steep trails a mile a minute en route to the high peaks. Emmy followed, usually in tears. Obviously Emmy wasn't destined to be God's Gift to alpinism, and so Mac took to going off on climbing vacations by himself or with a like-minded pal. But that was a long time ago. Things are different these days. He still goes back to the hills whenever a busy law practice permits but now Emmy goes along. Her alpine aptitudes haven't changed any. She has, however, become a strong trail and rough-country walker and loves it. What's more, she's the best camp cook north of the Mason-Dixon line. Lucky the climbers that start upward fortified by Emmy's marvelous menus! Emmy cut her coat to suit her cloth. She looked the facts in the eye and then worked out her own personal answer. She knew what she wanted, and what she wanted was to go along. So: she made herself essential in the pattern. You couldn't make Mac go to the mountains without Emmy now. And she herself has a wonderful time.

One more thing occurs to me before closing. If you are a high-altitude parent who would like your youngsters to enjoy climbing: what I've written applies to children just as much as it does to wives. See that they have a good time in the hills, and take pains to adjust the schedule and tempo to their strength and abilities. Give them from the very beginning a sense of success and approval and you'll find you have a bunch of climbing maniacs in your family. They'll be at you all the time to take them into the mountains. What a Utopia that would be!

Oh! For the Life of a Packer!

By NORMAN B. ("IKE") LIVERMORE, JR.

DEAR MR. PACKER: I have heard you know something about mules. Several of us college fellows want to get away after final exams. Can you recommend a good outfit for us? We figure six of us can get along with one pack mule or horse. We have budgeted ten dollars for the trip. Do you think that is too much? Your advice would be appreciated.

DEAR PACKER: I have a friend coming out from the East who doesn't believe how big the Sierra fish can get. Please advise a top fishing spot a short ride from some road where we will not be disturbed for two weeks. We want to get really far away.

DEAR SPIKE LIVERMORE: I have a seventeen year old son who is getting to be quite a problem. Could you take him off my hands a while this summer and make a packer out of him?

DEAR MR. PACK TRAIN: I hereby apply for a job as a packer. I have had some experience with stock; I've camped a lot in the mountains, am a hard worker, will be available for several summers. I can't shoe, but am willing to learn. Please let me know on post card. P.S. I can dig pits etc. if necessary.

These abbreviated epistles may give an inkling of the variety that fills a packer's life beginning, he hopes, in early spring, and lasting well through deer season. Any similarities to letter writers or addressees, alive or deceased, are strictly disavowed; the passages are merely an attempt to illustrate that a packer's life doesn't lack variety in the field of letters.

As for the life itself, perhaps last year's High Trip will dwell a bit longer than any in this packer's mind—variety in incidents in the trip itself, among the packers, the mules, the Clubbers, but, of particular interest and satisfaction to me, a variation in the type of packer that seems to be evolving.

For several years prior to the war, I had upon many occasions suggested that college men were a natural for summer packing jobs because of their availability during summer vacations. The old salts among packers always disagreed with me, and I doubt not that most of them still do, but that's only because they have not seen the teamwork between college, or stub, packers and the more experienced professional packers, as demonstrated on recent High Trips.

Whether the trend toward using more college men will continue, it

is not possible to forecast accurately any more than we can predict what the Sierra Wilderness will be ten years from now. But one thing is sure: the really experienced old-timer type of packer, born and raised handling stock, is becoming a thing of the past. Increased urbanization, fewer large ranches, fewer horses used to handle cattle, rapid mechanization of farms and ranches everywhere—all these mean fewer experienced stockmen coming along. What some one said as a joke is really more than half true—"all old time packers are either dead drunk or dead, period."

As a concrete illustration of the scarcity of practical experience in handling livestock I can cite the statement made to me three years ago by a faculty member in the Department of Forestry, University of California. At that time, he said, there was not a single student in Forestry who had not been raised in a city. No wonder none of them warmed up to the idea of hazing mules over Sierra trails as fledgling packers!

In spite of the basic trend, however, there still seem to be plenty of young and eager college and high school men who are lured by high trails and the fascination of learning to handle a string of not-so-gentle mules.

As for mules themselves, who can see any change? Not I, for one, nor do I expect to see any in my lifetime, unless some superambitious packer succeeds in breeding mules for docile demeanor as well as plodding power. But who wants a change in Sierra mules, when they are already perfect? Well, that is, nearly perfect. What I mean is, on second thought, perhaps not nearly perfect, but at least chock-full of character and interest. If you don't believe me, take a look at some of the '48 High Trip mules (and their bosses).

First of all there was *Red*, oldest mule in the outfit but still young and tough in action. I have it on good authority he was a jerk-line leader on a borax team in the early 1900s. Murt Stewart, who packed him, will be first to acknowledge that *Red* was far from old in action and disposition.

Doris was as young and impetuous as *Red* was old and wise. She it was whose short legs and nervous pull-back wrecked Ben York's string on the fatal day over Colby Pass. Black and shiny, hard to catch, pretty enough to win a ribbon in the mule beauty contest, she was the sauciest number in the corral.

A "pack" but not a mule was Pete Garner's *Buck*, a big, clumsy, dumb, awkward, and obstinate horse who tried Pete's patience many times by specializing in splintering his pack boxes on all available trees and rocks. This was the horse's first High Trip. As far as Pete is concerned it is probably his last.

Speaking of horses, Jack Heyneman packed a problem named *Hoot*.

She was a mother who left a weaner colt at home in the Owens Valley and was pretty unhappy at all times thinking about him. So much so, in fact, that we had to rope her the first day leaving Owens Valley on the deadhead to keep her from running home. Heyneman, I am sure, wished she really had gone home.

Big and awkward-looking, but strong as steel and distant in demeanor, was Charlie Gilmore's *Coso*. He distinguished himself when I first imported him from the plains of Nevada in 1946 by promptly high-tailing it to the sagebrush country south of Olancho. We did not find him for almost a year. After many false rumors and wild chases, he was run down near a wide spot in the road called Coso Junction; hence his name. *Coso* is one of the two or three mules in the outfit who doesn't like barley, if you can believe it.

And then there was *Cognac*, famed among the packers as the mule who acts innocent but plays rough. He appears to be the gentlest of mules. It was only natural, then, that when it was suggested to Murt Stewart that he ride him bareback one pleasant layover day, Murt answered, "I believe I will." Murt's belief was short-lived because *Cognac's* docility did not extend to bareback riders. Two jumps and Murt hit dirt.

Another old-timer was Hal Pflueger's *Dearborn*. This stout gray was regarded as an old mule when we packed him on a trip I took with Ted Cook in 1937. On this trip we cracked a lady rider's rib, broke a fisherman's back, completely lost our stock for a day, encountered hailstones the size of marbles on Foresters Pass, but it did not faze *Dearborn*. Nor was he any more fazed or less efficient 11 years later, in '48. In fact, he is still a youngster, at least when it comes to the ladies; his steady crush on Marge, Dr. Heller's seductive sorrel mare, was acute.

Then there was *Brownie*, one of Bud Steele's stalwart string, who was a distinguished renegade in 1946 because he continually eluded wrangling. In fact, on that trip when we reached Charlotte Lake, he and his side-kick, *Snake*, simply shoved off and went home. Always something to worry about in the wrangling department!

These are but a few of our horses and mules. The printed word is a painfully poor portrayor of their idiosyncracies and charm, traits of endearing (or damning as the case may be) character that mainly packers will understand and appreciate but which all who follow High Trip trails should come to know and enjoy.

Enough for characters; how about some of the '48 packing incidents, a few of the many that occur over the years?

Packers, you know, sometimes get lost. This happened to one of our

best on our first moving day. In spite of instructions, he took off from Zumwalt and shortly thereafter headed up Copper Creek. He was practically to Tent Meadow before he saw his fellow packers stringing out up the canyon far below him. No handy tethering spot for his string that night; the other packers were all unsaddled when he got to camp.

While a lost packer is a rarity, such is not the case with mules. One of Whitney Pack Trains' most lovable characters is a big black gent named *Jed*. He was named for that peerless pioneer Jedediah Smith, and well is he named, because he is always pioneering off by himself, usually in some tasty bit of bunchgrass that keeps him too busy munching to check on the whereabouts of his fellow mules.

At Bench Lake, Jed several times distinguished himself by making a solo run through women's camp, trying to get his bearings. But he really outdid himself on the day we moved to Marion Lake when he was not located until 2 P.M.—sunning himself on a strictly rock-climbers' ledge, peering at his fellows threading their way down the grassy South Fork basin 2,000 feet straight below. It was Jed's getting lost that caused several of the boys and me to take the precipitous trail directly down into the South Fork, trying to make up for lost time. If you want a real thrill of a horse trail, try that one some time.

Who will forget Bud Steele's granite tumble on the north side of that never-again pass, Cartridge, when he cartwheeled over mule-sized boulders to keep from being mashed by a teetering string of packs, including those so-and-so stoves? . . . Bud's miraculous escape was a morale booster for all. That is, all except those who needed important items of the animals' equipment, the shoes. Such a shedding of these as occurred between Marion Lake and the Middle Fork I have never seen. This started a trend of barefootedness that we never did catch up with; in spite of heavy stocking of shoes in the middle of the trip, we ran out at Milestone, and I had to send Dick Troeger out early just for shoes and nails, a most discouraging situation.

Our two days' packing over Colby I shall never forget—that patch of snow so short and narrow and yet so maddeningly deep and rotten-boggy, the loose-rock hazard, the endless pauses for wind on the way up, and finally the quick tragedy of the rolled mules, a fatality for one of Ben York's string, and very close calls for Garner and Troeger.

And so the four weeks quickly passed: lots of hard work, some casualties, plenty of tough wrangling, too much night cache relaying, plenty of snow, and far too many rocks. But with it all, days of delicious lay-overs, good fishing, just enough rain, plenty of grub, excellent campfires,

and good team spirit. Another milestone in the long and distinguished High Trip history passed; a unanimous vote of commendation, appreciation, respect and affection to our leader Dave from packers, mules, and all the rest of us.

An overnight stay at Kings Canyon road end, an all too fleeting good-bye to friends among the Clubbers and commissary, and we hit the Bubbs Creek trail back to Owens Valley. So ended the forty-third High Trip for this particular bunch of men and mules. Who knows how many will repeat in '49? But repeat or not, as the years come and go, let's hope our High Country remains unspoiled. Let there be other mules, other packers, other memories of campfire and trail; but may the meadows, lakes, and passes, and the trails that link them, remain as unchanged a part of the mountain scene as the sky that lights it!

Lightning and the Mountain

By JAMES R. WILSON AND ROBIN HANSEN

THE URGE to know more concerning the effects of lightning becomes stronger when one is on a peak with the static charge beginning to make its power felt. When every projection in the vicinity, and finally the climber himself, begins to spark and the air is filled with ominous hissing, the desire to be in camp becomes overwhelming. Since this desire cannot always be satisfied, it is well to know what to do at this time.

The reasons behind the classical warning to be off the summit and ridges in a lightning storm can be seen when the mechanics of the lightning discharge are studied. Owing to rising currents of air and various other disturbances in the atmosphere, the clouds in cold-front and line-squall weather obtain high charges of static electricity. When these charges build up to such magnitude that they can overcome the resistance of the air, they tend to join their counterparts on the ground. This is similar to the action of a spark plug in the automobile engine, magnified millions of times. The discharge between cloud and ground is accompanied by currents which dissipate themselves over the ground surface.

A study of static electricity reveals that the cloud charge prefers to discharge to a sharp pointed object rather than to other shapes. This, coupled with the relative closeness of the summit of a mountain to the cloud, is the reason for the danger at the top of the mountain. However, where there are low clouds and a ridge, discharge is likely to occur to points on the ridge rather than to the summit. This can be seen in figure 1. Once discharge has occurred, the current flows over the surface of the rock toward the base of the mountain. It flows perpendicular to the lines of equal potential. These lines and their distribution are shown in figure 1. The closer the potential lines are together, the greater is the current flow. Near the summit the lines are very close together, while near the base, they are relatively far apart; the ground currents are strong near the top and weak near the base. Also, the lines are close together on vertical walls, while on the horizontal ledge they are far apart. Similarly, it is found that the current flow is greater on the face of a mountain than on its ridges.

The two types of danger from lightning consist in a direct strike and in a subsidiary danger from the ground currents. Anywhere but on the summit or very near to it the chance of being the victim of a direct bolt

is small and the probability of being killed is almost certain. In contrast, the chance of meeting ground currents is almost certain, while with a few precautions the probability of being injured by the currents is small.

The precautions to be taken against a direct strike consist in getting away from the summit or ridges, and, if this is impossible, to get as close to the rock as possible without lying down. A squatting position with head low is ideal. Any pinnacle in the vicinity that is five to ten times the height of the squatting position will give lightning-rod protection.

From a study of potential distribution on an idealized mountain (figure 1) several important theoretical conclusions may be reached.

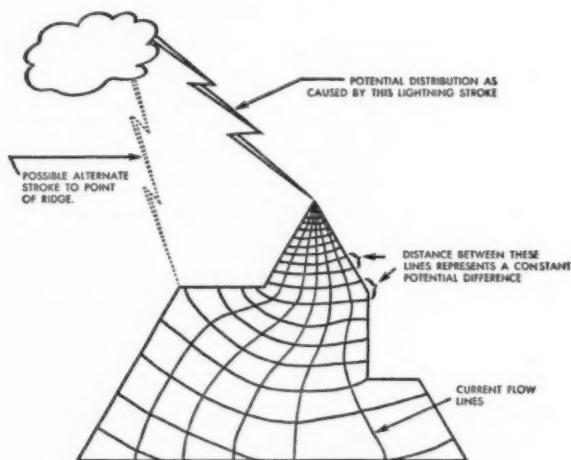


FIGURE 1. Idealized thin-plate two-dimensional mountain.

Since the potential lines are farther apart near the base, it is apparent that it is safer near the base. The long ledge is safer than the sloping ridge near it. The vertical portion of the ridge conducts large currents. Thus, one may conclude that the steeper the rock, at any given height above the base, the more dangerous its ground current.

The protection from ground-current injury should consist of getting on rock with the least slope available. The climber should be sure that he stays as far from the wall as possible to minimize the danger of a discharge from the wall to the body. One point of contact with the rock should be the maximum. The danger of rappelling is immediately appar-

ent, as it automatically gives the climber two points of contact with a very great potential difference.

Combining the precautions against both ground currents and a direct strike, we find that the best position would consist of squatting with the head down and feet together in the middle of a wide ledge or as gentle a

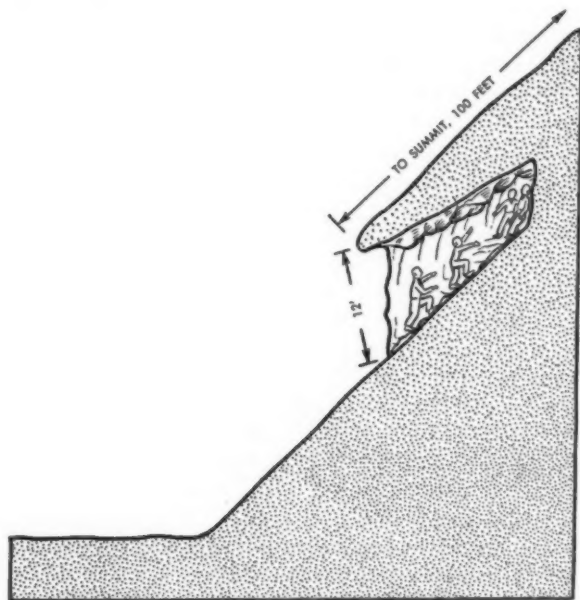


FIGURE 2. Representation of the cave on Bugaboo Spire.

slope as is available. Ice ax, crampons, pitons, and other sharply pointed objects should be some distance away. Possibly the ice axes could be placed ferrule up to form crude lightning rods (especially if the handle is wet or its conductivity is otherwise improved, e.g., by wire).

The cave in figure 2 is similar to the one in which the accident on Bugaboo Spire* took place. The potential gradient is seen to be high in the vicinity of the cave, owing to the steepness of the floor and sides. It is presumed that this is the reason for the injury and deaths, inasmuch

* See "Still a Bugaboo," p. 68.

as a direct strike inside the cave is highly unlikely. All were leaning against the rock at the time of the discharge, which would account for the burns that they suffered on the back and legs. From an analysis of this situation, it would seem that a position on the somewhat level portion of the ridge would have been safer.

In general, shelter should be taken in a cave only if it is deep in comparison with the vertical height. Again, the body should not touch the sides and the head should be as far from the top as possible. In a similar situation during the same storm, a party on Pidgeon Spire was subjected to numerous shocks and noted discharges between the head and the roof of a cave.

Seldom will there be similar situations from one mountain to the next and from one storm to the next, so some ingenuity will have to be applied, and the merits of one position weighed against those of another at the time. *The isolated squatting position should be used in one form or another, as it affords the maximum protection.* And even though one should be far from the summit he should not overlook the possibility of lightning's striking some distance down the ridge with resultant danger from ground currents.

These suggestions for positive action were brought forth in the light of previous experiences and from an analysis of the behavior of electricity. They are not to be regarded as guaranteed safeguards, but more as enlightened guesses. Further work should be done on the subject, and any suggestions and experiences should be reported to the Mountaineering Committee.

Roads in the National Parks

BY HAROLD C. BRADLEY AND DAVID R. BROWER

CONFLICTS are seldom easy, and less often pleasant, to resolve. They are especially uncomfortable when friends are pitted against each other. In days like these, when conflicts oppress us each day, we may be forgiven if we ask to be spared all but the inevitable among them. Weighed against the problems our atomic physicists have presented us, the conflict over what engineers ought to do with national-park roads seems trivial indeed. We should like to escape it. But we cannot if we wish to have unimpaired national parks to enjoy while we are solving our problems of high importance, and when our children are solving theirs.

We have had national parks to repair to for eighty-five years now. For the first sixty years it was believed that the more tourists who reached the parks, the more defenders of parks there would be. More recently, however, we have learned that what is easily accessible is also easily overcrowded and impaired. The National Park Service is progressing toward the control of this form of impairment by modifying the facilities in the parks. The Public Roads Administration meanwhile is engineering "improved" national-park roads that will bring still more tourists to the facilities the Park Service is trying to modify and the areas it must preserve. Even though impressive park-travel figures may be necessary, still this engineering trend is unfortunate. For the roads themselves could be designed to diminish excessive trampling, overcrowding, and vandalism by filtering out those motorists who cannot tolerate being slowed down by scenery, and the roads could at the same time retain the full charm of the national-park display for the motorists who want it to be preserved.

We need not labor the point that most roads are the lifeline of commerce: more people and things get to more places faster, and highway engineers should do and are doing their best to increase the quantity and safety of travel. But roads have also let us reach the horizon so swiftly, at times, that we have lost some of our perspective. And when we see a marked distortion of perspective in national-park road planning, it is time to ask whether national-park roads now on the boards or now being built need to be as "good" and costly as they are.

This is the first in a series of articles to which there is an open invitation to contribute, concerning the standards and purposes of national-park roads; the series is embarked upon because it is the unanimous opinion

of the Board of Directors of the Sierra Club, of the club's Conservation Committee, and of the other persons of widely varied interests who have been consulted, that these standards and their consequences require analysis. It is important that all those who know and who use and who highly regard the national parks should consider the questions here raised as carefully as they can; it is also important that each make up his mind and speak it.

Park Roads: Access or Display?

Park engineers may advocate a road to make certain sections more easily accessible, but, before such a road is approved, a real need must be demonstrated and many questions answered. Will the road destroy any natural values? What will be the ultimate result? Will it lead to further developments in the future which will eventually clash with the primary purpose of the area? There are many members of the [National Park Service] organization who believe that some of the parks have already become overdeveloped and that even more vigorous controls must be exercised if in a hundred years or five hundred years, they are to resemble even remotely their original condition.

—Dorr Yeager in *Your Western National Parks* (1947).

THE QUOTATION from Mr. Yeager will serve admirably as the text for the brief discussion of the problems connected with roads in our Western national parks which follows. Attention is directed particularly to the last sentence, which is a warning, and significant since given by a man long a member of the National Park Service, whose experience in the field lends real authority to what he says. If there is division of opinion on the question of roads and developments among officers of the Park Service—and I can confirm the fact—it is high time that we, the absentee owners and trustees for these properties, looked into the situation.

Before attempting a discussion of general and specific problems connected with park roads, it may be appropriate to recall the words of the Congressional Act which created the national parks and the Service to administer them, as a common starting point. The Act of 1916 reads: "... to conserve the scenery and the natural and historic objects and the wild life therein, and to provide for the enjoyment of the same *in such manner and by such means as will leave them unimpaired* for the enjoyment of future generations." The italics are mine, but warranted. Over the decades many of us have forgotten this restriction and have come to feel that the Act did, or should, end with the words "*for the enjoyment*

of the same." Open to everyone, paid for by all of us, like the public library or the museum, the parks are set aside for that group in the community which really desires the charm and inspiration of their scenes and which is willing so to enjoy them that they will remain intact for future generations to enjoy.

In the actual administration of the Act it is clear that certain compromises with the literal meaning of the words are required. This leads to a variety of individual interpretations and differences of opinion honestly arrived at. As conservationists however, it is our function to demand frequent reference to the original Act, and as close an approximation to its literal meaning in practice as can be made. Particularly today, in 1949, and with the record of what has happened in some of the parks clearly before us, it behooves us to weight heavily the factor of *preservation*, where in early years the emphasis quite naturally was to obtain increased *accessibility*.

Mr. Yeager points out that many people, some within the Park Service itself, are aware that some of our parks are overdeveloped. Because of his familiarity with Yosemite National Park and its great popularity, it is fair to assume that he had it specifically in mind. At any rate, an analysis of what has happened and is happening in Yosemite is important here; it was the first park to be set aside for the nation, it has been extremely popular, and a wealth of information about national-park development is therefore available in the story of Yosemite and its roads.

William E. Colby, from his exceptionally long and intimate association with Yosemite Park and its problems, points out in more detail the evidence of overdevelopment of the valley and the acute problem of overcrowding there.¹ There is little question in the minds of those who frequented Yosemite Valley in the early decades of the century, and who visit it now in mid-season, that there is overcrowding today, and deterioration as a result of too-intense utilization. Those who do not feel we have reached this point would yet undoubtedly agree that somewhere along the curve of increasing occupancy such a point will be reached. All of us therefore, whatever our individual interpretation of the words may be, will agree that it is desirable to discover the factors which lead to overdevelopment and overcrowding and to find, if possible, ways to check them.

The problem is undoubtedly highly complex, and the causes numerous. Six factors are of major importance in the crowding of Yosemite Valley:

¹ (See "The Fatal Beauty of Yosemite", *National Parks Magazine*, January-March, 1947. *Sierra Club Bulletin*, March, 1948.)

1. The increase in population of the Central Valley and the coastal areas near enough for easy access.

2. The increase of free time, which makes vacations and week-end trips to the valley a frequent possibility for many people from these regions.

3. The increase of free money with which to finance such vacations.

4. The greatly increased ownership and use of automobiles.

5. Highways to provide for easy and rapid access.

6. The presence in the valley of numerous attractions imported from urban life which add artificially to the original scenic display and draw in many who would not be there without them.

Of these factors only the last two can be controlled in any way by the park administration or by us, the owners of the property. It is not our purpose to explore what can be done to lessen the effect of factor six, though it is probable that over a period of years some of these artificial attractions, such as swimming tanks, nightly dances, golf, and tennis, could gradually be eliminated. We may even conclude that what has been done in Yosemite Valley is irrevocable and that decreased use can only come about when some such economic change as a depression occurs or when there is an eventual stringency in motor fuel. So far as I know we have no data on which to base even a guess about the numbers affected by factor six.

On the other hand, the factor of roads is so clearly important in the development of any large-sized park that it does appear desirable to consider it carefully in connection with future plans. It is perhaps the only factor which we are in a position to control. Roads bring in the crowds. The more effortless and rapid the driving, the more the drivers—not only those who seriously desire to see and appreciate the parks, but also those who represent the merely restless driver and those who will not be attracted to any region which does not offer the thrill of speed. The trailer tourist is another group whose control is possible by the character of the road planned. These and probably other categories are to a greater or lesser degree influenced by the quality of the roads provided to and within the park.

Certainly a visit to the Yosemite today has little of the element of a pilgrimage it once had. The highway provides for swift travel at a moment's notice, requiring of the driver neither effort nor planning in advance. It has become a casual affair, often undertaken with little clear purpose so far as seeing and understanding the unique park values is concerned. For some, indeed, it will still be a journey to see the early

(
who
serio
(
scen
to tr

National Park Roads

How Much for Access, How Much for Display?

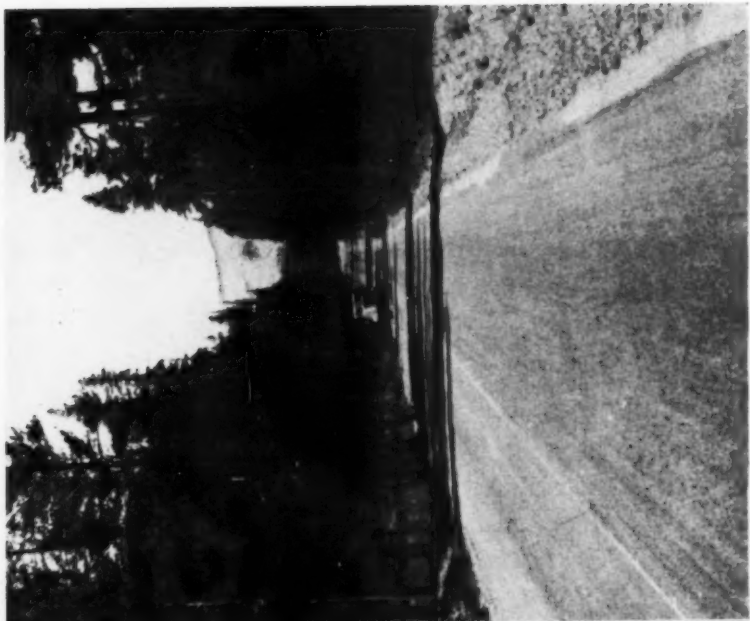


(Above) A MODERN ACCESS ROAD (U. S. 50, near Altamont)—costly construction for the traveler who must save time. It makes its own contours; capacity is great. It invites the speed that leads to serious accidents, but its high standards are a necessity.

(Below) A DISPLAY ROAD (Big Oak Flat Road, State 120). Its standards harmonize with the rugged scene. It is not costly, does not invite speed and bad accidents are rare; poor maps lead poor drivers to try it. Access roads are fine outside the parks. Do we need them inside?



TOO MUCH CHARM? (*Big Oak Flat Road near Carl Inn*). Frequent gear shifting and turning are now a part of driving along this charming mountain road. Is the inconvenience so great that terrain and forest must be cut to make way for a highway providing speed?



TOO MUCH ACCESS (*Tioga Road near Dana Meadows*). The pleasure of speed—at what cost? Here no canopy overhead, little feeling of the mountains. More important than the scars of such a highway is its indirect impact on roadside and terminus.

speed—at what cost? Here no canopy overhead, little feeling of the mountains. More important than the scars of such a highway is its indirect impact on roadside and terminus.

gear shifting and turning are now a part of driving along this charming mountain road. Is the inconvenience so great that terrain and forest must be cut to make way for a highway providing speed?



ALL-YEAR HIGHWAY NEAR ARCH ROCK STATION, YOSEMITE. Two narrow roads, each built for one-way travel in order to retain and display a single minor feature, carry more traffic than Yosemite Valley can withstand. Accordingly, steps are being taken, on the one hand, to



reduce the peak capacity of Yosemite Valley campgrounds from 13,000 to 5,000 persons, in order to reduce impairment of forests, meadows, and mood. On the other hand, roads are being engineered and planned to make access to the valley simpler and quicker.



A

\$20
wo
Ra

it
int
to
inc
ad

act
hu
Tr
sc
co
tr
hi

ex
w



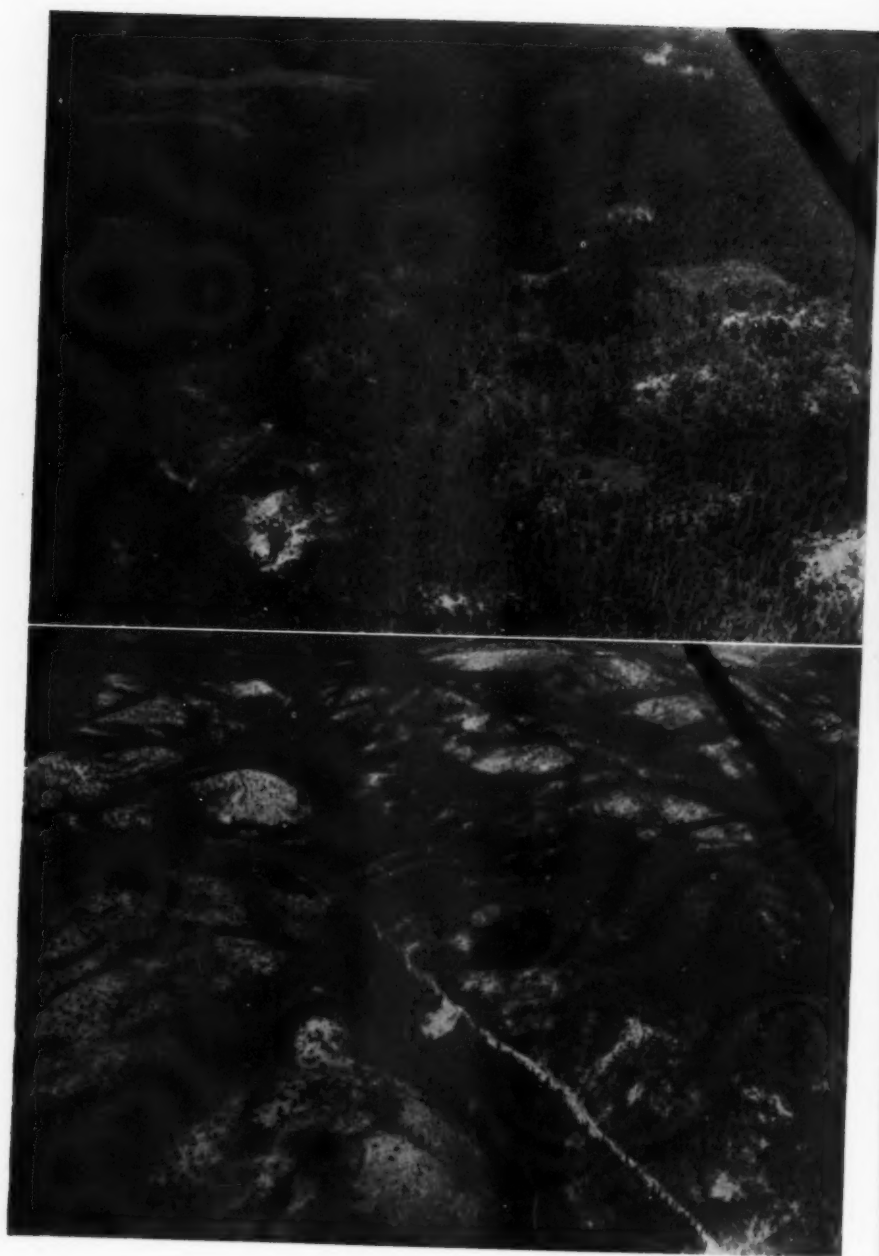
A Study in Road Types

(Upper left) New Tioga Road near Crane Flat. The Government plans to spend an estimated \$200,000 per mile for 21 more miles of road of this standard. The expense of a few feet of such road would have covered the cost of a telephone line that would have caught Yosemite's disastrous Rancheria Mountain fire in time last year; funds weren't available for the telephone line.

(Lower left) This display road can be adequately improved for about \$20,000 per mile. Even now it could still, theoretically, carry enough traffic (at 3 persons per car, 20 miles per hour, 110-foot interval) to bring 48,000 persons to the park checking station per 18 hours. The expenditure required to realign it would increase speed, lessen safety, impair display, and more than double capacity; inevitably and soon it would overcrowd the terminus still more. Nevertheless, while funds for park administration and interpretation are pitifully inadequate, costly improvement is now planned.

(Above) The completion of this limited-standard highway in 1926 resulted in changing the character of Yosemite Valley use and development. It started the trend toward the short-term visit by hundreds of thousands of tourists who demanded and got urban entertainment. As the late Dr. Tresidder wrote, one of them asked, "What are you supposed to do around here? Look at the scenery?" Rangers, no longer ranging, directed traffic. Interpretation was hampered. Government and concessionaire facilities became inadequate. Forests, meadows, and wildlife suffered. Percentage of trail travel dropped heavily. In short, the highway brought the overcrowding for which new highways are proposed as an antidote.

Even if we disregard for the moment the effect of overuse upon the park scenes, we must still express concern when those who would enjoy a national park for itself are crowded out by others who want just another resort.



A 3

sec

Flat

E, t

liche

can

chie

soon

pavi

the

wish

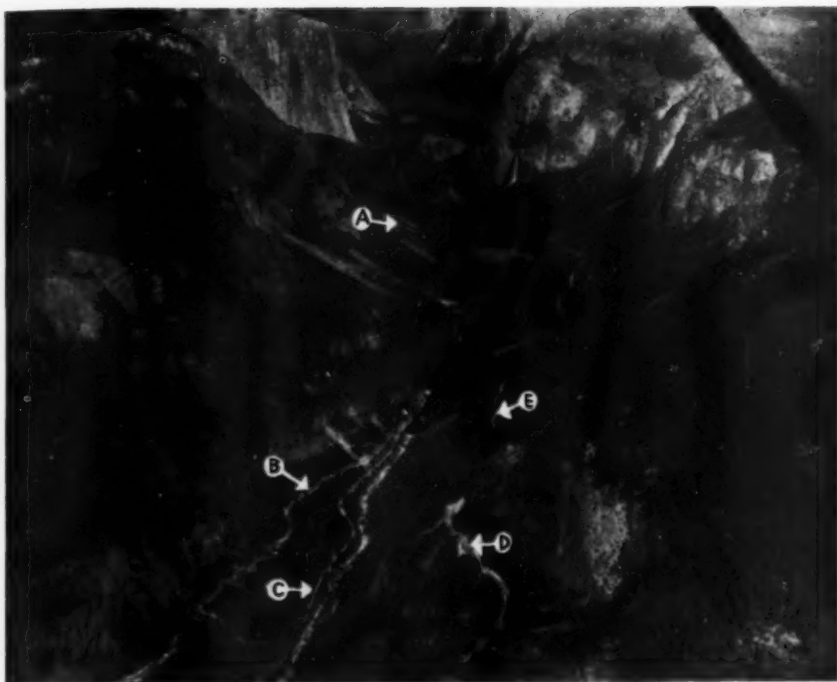
fires

7

resu

leav

road



A Study in Road Scars

(Upper left) The scar of the old Tioga Road north of White Wolf is just below center.

(Lower left) The scar of the Tioga Highway south of White Wolf. It has been contended that a second simple road (to permit dividing of traffic) would scar the scene more than the highway does.

(Above) The road history of Yosemite Valley, written in road scars: A, the original Big Oak Flat Road; B, the new one; C, (along the river) the All-Year Highway; D, the new Wawona Road; E, the old Wawona Road.

The road-produced scar matters much less than the scar-producing road. Trees, shrubs, and lichens will tend to heal the scars, but not the damage to parks by overloading roads.

Isn't access here already adequately engineered? Improving roads to overburdened areas can only aggravate the burdening of those areas. The engineers and landscapists nevertheless seem chiefly concerned lest they underengineer; they feel that their failure to improve roads enough will soon require relocation and more scars. Logical extension of this reasoning in Yosemite would call for paving more of the floor for parking; widening its roads; devoting more space to campgrounds where the campers want them; increasing government and concessionaire facilities. Instead, the planners wish to move many facilities out of the valley, to restrict the gathering of roadside wood for campfires, and to move many campers far from the superlative valley.

The design of a road can, by screening out those who cannot tolerate slowing down to enjoy scenery, result in diminishing the trampling, overcrowding, and vandalism in the parks; it can also thereby leave room for those who know or wish to know the high purpose of the parks. Is this concept of road design adequately appreciated in the national parks?



APPENDIX: WINTER NEAR TIOGA. (*Above*, Tuolumne Meadows and Cathedral Range; *below*, on the slopes of Mount Dana.) Mere realignment of a road cannot make accessible any first-class ski-resort development in the Yosemite High Sierra. The only slopes near the Tioga Road which are open enough or provide adequate altitude differential are either too windswept or at too high an elevation to be ideal.

The type of road that could provide dependable access to Tioga skiing would invite trans-Sierra and transcontinental traffic through Yosemite National Park and retard opening of better slopes and a better route that a realignment on Sonora Pass, for example, could bring about—besides overcrowding and otherwise impairing the presently unique semiprimitive Tuolumne Meadows region.

Photographs: 1 and 3-9, by Harold C. Bradley; 2, by Ralph H. Anderson, NPS; 13, 14, by William C. Bradley.

blooms of the dogwood and the majesty of falls and granite cliffs. For many it is apt to be for a day or two of fishing, of golf or tennis under pleasant surroundings, for a coat of sun tan, or the pleasant social life which the valley offers day and night. The park becomes thus, in the minds of many tourists, just another recreational resort within easy reach.

If there is a sufficient increase in the number of those who come to the valley as a recreational resort, it is almost inevitable that the park will become just that type of facility. This is certainly not its original purpose. City parks, state parks, commercial recreational resorts like Sun Valley or Aspen, are highly worth while and we need more of them. But above and beyond them—or at least distinct from them—stand the national parks, a sort of synthesis of the public library, the art gallery, and the museum, out of doors and full of native inspiration for those who desire that sort of inspiration. In the museum, the art gallery, the library we clearly recognize the need for quiet, leisure, and freedom from the distractions of massed humanity out to entertain itself or to be entertained. Massed humanity has its inspiration too and its place—as at a football game, a circus, or a Coney Island. But the public library ceases to function at some point if overcrowded. So does the art gallery and the museum. So, too, does the national park. It becomes a recreational resort. Something of this sort has begun to happen in Yosemite Valley.

In the planning and building of roads in the national parks, this possible effect of the road must be appraised with the utmost care if we are to avoid the deterioration which the original Act so specifically proscribes. The more fragile the region to which access is provided, the more rapid and permanent the damage done by massed humanity. There is no justification, surely, for building an access road to an area when the road will eventually destroy the very quality in that area for the enjoyment of which access is desired and provided. If there is sound reason to fear an easy access facility will destroy the inherent charm of the area to be opened up, then the road should not be built, or its standards held so low that only those seriously desiring entrance and willing to pay the price in speed and effort, will be likely to use it. It may be unwise, for example, to provide an access road which will invite the trailer village, or the commercial truck, or the flow of traffic from one point to another through the park merely as a commercial convenience.

Since 1936, when the Commonwealth Club of California completed its detailed study of highways in our mountains and issued its classic report,²

² "Should We Stop Building New Roads Into California's High Mountains?" *The Commonwealth, Part Two*, XII:22, 327-386.

it has grown increasingly clear that highways into wilderness or semi-primitive areas lead to their inevitable deterioration. In 1949 we should be very certain of the results before we approve new roads or the radical improvement of old ones. No road is justified except where absolutely necessary. Where a road is clearly required, its standards should be held to the minimum which will achieve the desired objective. To provide standards higher than the minimum is to provide also for the gratuitous sacrifice of the very values which the road is intended to display, because it will insure overdevelopment and overcrowding.

ROAD STANDARDS

The functional qualities of any road will be set by the standards to which it is built. So too will be its costs, the speed at which traffic will take it, the sense of security and the actual safety on it, the amount of immediate damage done to the natural scene, and the long-range changes which it will produce. For purposes of this discussion we need concern ourselves only with the items of surface width, shoulder width, radius of curvature permissible, and grade. These figures have been arrived at by the Public Roads Administration over many years of experience in road building in the national parks, and in consultation or collaboration with the park officers. The park superintendent can and occasionally does exercise a veto power over a proposed road when its standards or routing do not seem to him to be appropriate. During Colonel John White's administration of Sequoia National Park it was proposed to improve the road between Sequoia Village and Moro Rock. The plans drawn by the engineers called for a straight high-standard highway along a new route, while the Superintendent desired a more conservative improvement of the old route, retaining all of its charm. His refusal to approve the plans resulted in a transfer of the funds appropriated to another park, and it was several years before the type of improvement he envisioned was obtained. But in the end he won. The old road with its many curves was widened, all of its original charm preserved, without any of the predicted difficulties in handling traffic. A second similar situation developed when the approach road to Sequoia National Park from the west was converted to a high-standard highway. The superintendent refused to approve any radical change of the old road beyond the Ash Mountain entrance to the park. The results have fully confirmed the wisdom of Colonel White's uncompromising stand against high speeds and scenic sacrifice in the park.

Over the years it is understandable that procedures and specifications tend to become standardized. It is conceivable also that such standards

of "excellence" become more closely related to the purely engineering problems involved than they are to the fundamental problems of development of the park. Low-standard roads may not satisfy the highway engineers, but they cost less, create less immediate damage, automatically hold speeds to reasonable limits, and offer less invitation to overuse and crowding by automatically screening out many who have no real desire to enjoy the park for its own values, and on its own terms.

The Big Oak Flat Road from Harden Flat to the Yosemite boundary is an example of a road of low standard—if indeed it can claim any standards at all. It is essentially the old stage road as laid out in 1874, somewhat widened so as to carry two-way traffic at cautious pace, and surfaced to eliminate the dust. It is narrow, winding, and enroute to the valley there are grades that vary from the level or even downhill to ascents as steep as 12 per cent. It must be driven at low speeds; much of it in second gear. Curves are often sharp and many of them blind. Opposing traffic creates a mental hazard because it is often unseen until upon one. Very few accidents, however, have occurred along this road.

At the other end of the scale is the Tioga Highway, of which about two-thirds has been completed. Here the black top is 21 feet wide; the overall width of the road considerably more, the curves all of long radius and the grade nearly uniform and under six per cent. Many stretches of the road are perfectly straight. These standards invite to speeds of from 45 to 70 miles an hour; no shifting of gears is ever necessary; visibility is extensive. While the sense of security is great, the actual security is considerably less, and serious accidents, including two fatalities, have occurred on it. It has little of the charm of the lower-standard roads; it has made tremendous permanent scars in the more rugged section on the west, while through the forest it opens up a wide and obviously artificial corridor.

In between these two extremes in road standards are such well-known roads as a Generals' Highway in Sequoia and a section of the All Year Highway along the Merced for several miles above the Arch Rock entrance to Yosemite Valley. These roads carry heavy traffic without difficulty; they vary in width and in grade; they follow the contours of the region they traverse, with many curves. They automatically require speeds of about 30 to 40 miles an hour, and they provide scenic charm and a speed at which it can be seen and appreciated. Incidentally, just east of the checking station at Arch Rock, the road separates into two narrow roads and thus divides traffic. Although the eastbound member is in places not over twelve feet wide it carries without difficulty the

full load of traffic on this most traveled of all the park approaches. This is a remnant of the old stage road from El Portal; the engineers of that day, less rigidly bound by their own standards than they appear to be today, were content to preserve the old stage road just about as it was, for its inherent interest and charm, and the curio value of the Arch Rock.

The question is often raised, since high standard highways are easier to drive, Why should not the tourist be provided with the most comfortable possible travel facility? There are several answers:

1. The high standard road is costly—the higher the standards the higher the costs. A former park superintendent of long experience with park roads, suggests that \$200,000 per mile is a fair average for building the high-standard highway in moderate terrain. A lower-standard road can be satisfactorily improved by widening, etc., for about \$20,000 per mile. The cost of building a road like the Big Oak Flat Road might be somewhat more than this figure but far less than the highway—say a fifth. We foot the bills.

2. The sacrifice of scenery is many times greater in the construction of the high-standard highway. Where the Tioga Highway ascends the north wall of Yosemite it has left permanent scars visible for miles. Where it traverses forests it opens a wide corridor. The driver no longer travels an intimate trail through and under the forest as he does, for example, on the Big Oak Flat Road. He drives down a wide open slash that is obviously artificial and precludes any sense of intimate contact with the forest trees, shrubs, and flowers. He sees little of the scenery which flashes by, except the view ahead along the axis of the road and the white stripe. Nor can he stop easily and pull off to one side to see in more detail something that has caught his attention. Along most of the highway this is impossible because of the ditch or highly dangerous owing to the speed of traffic approaching from the rear.

Because of the requirements of uniform grade, straight lines, and long-radius curves, the road takes an artificial route. It bears little relation to topography. The road can ignore contours by creating its own with cuts and fills, whereas a trail or a lower-standard road follows faithfully the contours of the mountains, and so retains most of the natural scene.

3. The long-range changes which the broad highway is likely to produce and the ultimate deterioration of park values may be very great—a price which may indeed be too great to pay for speed and effortless driving. Certainly the conservationist will often prefer a compromise facility which does not entail the sacrifices of the standard highway, if at the same time it can provide adequately for the genuine needs of park visitors.

It is certain that the standard highway will invite more people into the area opened up. That indeed is its purpose. But will it produce an undesirable degree of crowding, which can be delayed or avoided by an adequate compromise? If so, the compromise would appear to be the better solution. Yosemite Valley itself gives us the picture of what the effects of new highways are—or what the effects of converting low-standard roads into high will be. In the valley, crowding has become the major problem, with no solution in sight. While we may agree to write off the changes which have overtaken the valley during the recent decades, we might well be conservative about initiating these same changes now in other less easily accessible areas of the park. The standards of any proposed national-park highway are the one factor which we can control and which carry in themselves the seeds of what the future development of the region will be.

FUNCTIONAL CLASSIFICATION

National-park roads may be broadly divided into approach roads and roads for display. Actually most roads within park boundaries serve both functions. The typical approach road is the highway leading to a park. For the most part such roads lie outside the park boundary and are built by the state. In California these are the roads that lead across the flat plains of the Central Valley and on up through the foothills into the higher mountains. Appropriately they are built for speed. The tourists using them are intent on reaching their destination. The sooner they get there the sooner does their period of recreation and enjoyment begin. Scenery along the route is incidental and discounted in advance. Roads such as No. 140 out of Merced, or No. 41 out of Fresno to Yosemite National Park, or No. 98 through Visalia to Sequoia, are admirable examples of such roads. They are built for speed, with straight lines, sweeping curves, long visibility ahead, ample width, smooth surface, and low uniform grades. They invite to speed—quite properly. Charm is often completely lacking, and display subordinate.

At the park entrance, where the tourist stops to pay his fee and receive instructions from the ranger, a complete break occurs. From this point on, while the road still serves as an approach, the emphasis should be on the natural features of the park which it gives opportunity to enjoy. The road is, or should be, predominantly for display rather than for speed. Its character should emphasize its function. It should invite to leisurely enjoyment of the unfolding scenes, rather than to the thrill of speed. It should not require ranger patrols and speed traps to enforce the park limit on speed, set arbitrarily but reasonably at 35 miles an hour.

At some of the park entrances, the arrangements made to induce the new tempo and the changed interest of the tourist are very effective. At Ash Mountain the tourist is clearly informed of the long climb ahead and advised to make sure his radiator is full of water before he starts up it. He usually parks his car, stretches his legs, fills his radiator and chats with the ranger and his fellow tourists. He gets a valuable rest. He anticipates an interesting, perhaps a difficult, half hour's climb ahead. He realizes that he will be rising from a level of 1,500 feet, to an altitude of 6,500 at Giant Forest, from semiarid summer heat to the shade and coolness of well-watered mountains, meadows, and forests. He is mentally prepared for a thrilling experience and dramatic views as he makes the climb. Seldom is he disappointed, and he never thinks of complaining because he must travel slowly. This he realizes is indeed a part of what he has come for. The road and the park it serves are functionally in perfect harmony, and it carries its traffic load without congestion and without accidents. Perhaps at other park entrances more effective breaks in the travel tempo can be arranged by skillful planning. But unless the road inside the boundary emphasizes its function for display by its character, it will not prove effective. If the road invites to high speeds it is inevitable that the mood for leisurely enjoyment will give place again to the urge to speed, and its function as a display facility will be lost.

CHARM

Roads which possess the greatest charm are almost always curving roads. In Washington's Rock Creek Park and in San Francisco's Golden Gate Park, we have two examples of city parks where the roads and trails are laid out in curves, with appropriate planting to make the most of them in producing charm. Even along the main arteries of travel where the function of the road is to provide rather rapid transport, the quality of charm which the curving road possesses is carefully maintained. In both of these flat-land parks the roads could have been laid out more easily and with less expense in straight lines. By contrast, it is not a little disturbing to find roads in our mountains laid out in straight lines where the topography is all in curves; to find the charms of changing vistas eliminated to a considerable extent in the interest of speed.

In summary, it seems reasonable to provide for speed unlimited by straight lines, wide surfaces, sweeping curves, and the monotony of uniform grades on roads which lead to and from our mountain parks. (It is recognized that such roads will tend to produce crowding in periods of abundant time, money, and automotive facilities, but since they lie out-

side park boundaries they are also beyond the control of park officials.)

It is equally reasonable and in complete harmony with the scene and the purpose of the parks, to build roads within park boundaries whose primary purpose is display. These roads should provide their own inducements to lower speeds by following the terrain with curves and variable grades. They should lead to scenes typical of the park and provide inspiration and charm. Display roads may properly be of lower standards, retaining the inherent charm of the region traversed, costing less, sacrificing less, avoiding long-range deterioration by offering moderate checks to speed and overpopulation.

It is our purpose to present a more detailed discussion of some typical park roads, built or still in the planning stage, to which the above generalizations apply. Each road offers its own peculiar problems.

Kings Canyon: Extend a Highway?

THE QUESTION of how to extend the road into the South Fork Canyon of the Kings is not a new one; but it has a certain immediacy, for construction is imminent. There is some controversy about where and how it should end.

It will be remembered that in the summer of 1939, although many were loath to see it, a fine highway was completed from General Grant Grove to Cedar Grove. Spectacular engineering went into the highway: it starts its drop toward the river opposite the 8,350-foot wall of Spanish Mountain and traverses the most startling Kings Canyon cliffs near Horseshoe Bend. It is an extremely scenic approach road—and it has ended, utterly, the wilderness character of the South Fork Canyon at its terminus.

But along the last few miles the engineering wasn't quite spectacular enough. Below Cedar Grove the highway is so close to the river that a flood of the proportions that took out a large part of Yosemite's All-Year Highway in 1937 would bring even more havoc to the Kings highway. Almost immediately it was advocated, therefore, that there should be a second approach to—or escape from—Cedar Grove routed through the mountains to the south and west. This proposal, now dormant, would bring an additional load upon whatever development is finally decided upon for the South Fork terminus of the present highway.

Before the creation of Kings Canyon National Park the Forest Service had worked out an exemplary plan for development of the highway terminus. Cedar Grove was to be the center of all development until such

time as it was determined to put in a Cedar Grove reservoir. A loop highway was to continue up the north side of the river as far as the present dirt road extends, then cross the Kings to the Roaring River delta and double back to Cedar Grove. Campgrounds would be on the south side, corrals on the north. No road was to enter the park, the west boundary of which was to be a ten-minute walk up-canyon from where the road would loop.

After creation of the park and until the Park Service was given control of the Cedar Grove area, the Forest Service cooperated fully with those who were conceiving of the new park as a "wilderness national park," to use the words of the Kings Canyon bill. When the bill was finally voted upon, however, its "wilderness" had lost definition. Some constituents wanted it that way, and conservationists were in no position to argue about it. It became apparent later that an agreement had been quietly made that the road should extend to Copper Creek. At a Kings Canyon meeting of the Sierra Club directors in 1940, before this agreement was widely known, it was long debated whether the road should stop where the Forest Service had intended, or should continue to Copper Creek. It was a draw.

When the agreement did become known, the Sierra Club consented to contribute the necessary right-of-way over its Zumwalt Meadow property (the west boundary of which is here the west boundary of the park) provided that any road constructed would be kept as far back as possible in the talus under the north wall. The intent of this provision was to preserve a maximum acreage of the scenic flat along the north bank of the river for use by the public on foot or on horseback.

Action was postponed during the war years. Then, in the fall of 1946, the club directors met again in Kings Canyon, there to be presented with a revised Park Service plan for Kings Canyon road extension. Where a single road—a simple road—to the west side of Copper Creek had once been planned in such a manner as to leave the south side of the river for foot travel and to restrict the corrals to the Forest Service sites (as presently used), the revised plan called for a highway to go up the north side, continue across Copper Creek (leaving no natural road barriers upstream until the Bubbs Creek Stairs), cross the Kings to the south side, and double back before crossing the river again and completing the loop. Corrals, administration building, and dormitories would be constructed on the south side of the Kings and at Copper Creek.

The 1947 annual *Sierra Club Bulletin* carries a detailed report of what resulted: A special committee of the Board was appointed and given

power to act for the club. At the committee's instigation and upon request of the Director of the National Park Service, an analysis of plans was undertaken by Frederick Law Olmsted; his analysis was endorsed by the committee and approved by the Board of Directors of the club. The club stand was in effect that as many men as possible should see the canyon and the High Sierra region of the park, but that the development should not be keyed to the use of mass man.

Along with the Olmsted report the *Bulletin* published a revised Park Service map that seemed to reflect the intent of the report. Not until the autumn of 1947, after the directors had again met in Kings Canyon, was the full impact realized of that map's routing of the proposed highway near Zumwalt Meadow, on the Sierra Club property. The impact came with the discovery of survey stakes that marked exactly how the line on the map was to be translated on the ground. Some concern was felt, and subsequent conversations in Kings Canyon and in San Francisco with officials from the Park Service and the Public Roads Administration have not appreciably diminished that concern. We are apprehensive of two things: (1) of the ascendancy of engineering standards over national-park values—an ascendancy that the late Gabriel Sovulewski fought on Yosemite trails—that would impair what up to now has been the one good campsite in the South Fork Canyon; and (2) of the pressure that may develop to extend too good a road farther still, being mindful of the present reasons for the crossing of Copper Creek.

The standards that the Public Roads Administration calls for are considerably higher than those of a great portion of the approach roads from the San Joaquin Valley to Cedar Grove. The present planners seem to be adamant. They would like to have the Sierra Club donate all its land north of the river to the Park Service and let the road be built substantially as surveyed. They say that a new survey would be costly; construction of a route nearer the talus in the vicinity of the critical Zumwalt area would also be costly; grades must not exceed five per cent, and even that is high; none but the most gradual curves must be permitted; changes in grade must not be so great as to impair long-range visibility; a road on which thirty-five miles per hour is the limit must be of such standards as to allow a driver several hundred feet to stop once he sees an obstacle ahead of him; trees must be cut and the road so located that automobilists can have a good, low-level glimpse of the green of Zumwalt Meadow as they glide by (on the way to the picnic areas that will be laid out on the disintegrated, and often quite hot, granite of the Copper Creek delta—where few parties have cared to camp in recent years).

It is argued that it would be folly to build a less elaborate road and run the danger of scarring the landscape a second time when the realignment was demanded later on. It is further argued that lower standards would be hazardous—to the motorist if not to the terrain.

We contend, however, that the farther from the river the road is built, the more spacious and quieter will be the area for those who wish to travel it afoot or on horseback—and who would enjoy a pause here more than anywhere else in the South Fork Canyon. All the area between the road and the cliffs will be lost to this type of use; accordingly it is well to keep the road-to-cliff distance to a minimum.

The lowering of standards that would be required to move the road well back would not cause undue hardship to the motorist, nor serious hazard. A case in point is the approach to Muir Woods National Monument from Mill Valley. Here real-estate values have apparently been so high as to discourage engineers; either that, or there has been a certain appreciation of that which is picturesque and charming. As a result, the road is narrow (14 feet, much of it without shoulders), winding (25 curves to the mile, some of them switchbacks), and steep enough to require shifting of gears (grades are steeper on part of the approach to the San Francisco Bay Bridge than the P.R.A. will permit near Zumwalt). Nevertheless, enough people drive to Muir Woods to impair it, and the Park Service has contemplated the eliminating of picnicking there. The road may be hazardous to fenders and paint, but not especially so to life.

Compared to Muir Woods, the Copper Creek delta has a much less inviting picnic area, is far more susceptible to damage of its fewer flowering plants, and is many hours farther away from a large metropolitan population. Why, then, must national-park values in Kings Canyon be sacrificed in order that engineers might build a highway of twice or three times the capacity of an approach road that can overload Muir Woods?

Is the answer that if the foot traveler is to enjoy the intimacy of Zumwalt Meadow, then the motorist must be allowed to enjoy it too? Admittedly, the motorist and the foot traveler each has his share coming to him—but not enjoyably in the same place. It seems only reasonable to urge that some special reward be saved for the person who is willing to forsake the passing windshield-framed diorama—to get out on his own feet, to feel something besides seat covers, to hear and to smell something besides the ubiquitous, however indispensable automobile exhaust. There is no better place in the South Fork Canyon for such a special reward than under the cottonwoods, incense cedars, and sugar and ponderosa

pinos around the Zumwalt Meadow bend of the Kings—unless it's in the now untrampled meadow itself.

Any road to Copper Creek will go a mile beyond the scenic climax of the canyon floor; it will also make that climax so easily accessible as to endanger its preservation. If the determination to build the road is nevertheless wise and unalterable, will it not serve the park well to see that it is just a road and not a highway?

Realignment of the Big Oak Flat Road

FOR MANY MILES west of Yosemite the Big Oak Flat Road is, as we have seen, a low-standard mountain road. The blacktop surface averages about fourteen feet wide. Cars can pass without danger if the speed is low, but in many places the turns are rather blind, and what with the lumbering going on at Aspen Valley, the big logging trucks frequently present a real hazard and create apprehension. There are also some fairly long climbs in second gear, especially between the park boundary at Carl Inn and the Crane Flat checking station, at the junction with the broad Tioga Highway.

The current oil company maps, however, indicate that State Highway 120, the Big Oak Flat Road, is an approach road indistinguishable in quality from No. 140 and other standard highways. This is an unfortunate error because uninformed tourists who come in from the north select No. 120 as the more direct and shorter approach. Too late they discover they are not on a standard highway at all, but upon a difficult mountain road. The result has been a growing chorus of bitter complaints, not to the mapmakers, but to the national park. The hardest seven miles of the road are within the park, and the park ranger at Crane Flat is the first official target.

The State Highway Commission has indicated that No. 120 will, according to present plans, be rebuilt to a standard highway in about five or six years. (Pressure is now being brought in the legislature to move the schedule ahead.) In any event, the transformation of No. 120 into a real approach highway is planned and, we may assume, will soon be under way. Much of the road now, between Manteca and Knights Ferry, will take high-speed traffic. It is the logical route of approach from all points north of Modesto, and will relieve No. 140 of some of its heavy load.

The new highway underscores the threat of the trans-Sierra highway of course, though it is still possible to block that threat.

The section between Carl Inn and Crane Flat, seven or eight miles,

will be built by the Public Roads Administration whenever the state project approaches the park boundary. In the following discussion the old stage road from Carl Inn to Crane Flat is called the Crane Creek road, and the proposed highway through the same section the Crane Creek highway.

The Crane Creek Road ascends about 1,800 feet to reach the summit at Crane Flat checking station. It heads south and begins to climb abruptly as one leaves Carl Inn. Second gear is required and there are several easy switchbacks. At the 4,600-foot level it turns east again at Hodgdon Ranch, the old stage station, and skirts the lower edge of a charming mountain meadow. Here the road levels off and even descends slightly to the crossing of Crane Creek at the present public camp ground. From this point to the summit the climb is steady, much of it in second gear. Two miles farther on the road winds through the Tuolumne Grove of sequoias, climbs again steeply, with one sharp hairpin turn, and levels off at the summit.

The Crane Creek highway was surveyed several years ago, but the stakes are still visible and I have followed its route. From Carl Inn it continues east along the north bank of the Tuolumne South Fork. It crosses Crane Creek and continues southeast not far from the public camp ground. For the next two miles it roughly parallels the old road, but at a higher level and north of it, as far as the fire lane. Here it swings in a wide loop away from the old road and crosses the tributaries to Crane Creek at a higher level and several hundred yards north and east of the old road. It returns to the present route at the hairpin turn and follows it essentially to Crane Flat. The route along the South Fork avoids the rapid climb to Hodgdon Meadow and has a uniform grade of 6 per cent or less to the camp ground. The wide loop above the fire lane is also made to obtain the specified gradient and eliminate the hairpin turn.

Both the road and the highway are routed through the same splendid type of virgin ponderosa, sugar pine, and cedar forest, so there is little to choose between them in this respect. But the highway will bypass completely the two features of this region worthy of special display and exhibited by the road: the lovely mountain meadow at Hodgdon Ranch, and the famous Tuolumne Grove of Big Trees. This forces one to the conclusion that the Crane Creek highway is not to be considered a display road at all. It is designed for speed and the single function of approach.

We may well question the wisdom of this conception of the highway. As owners we ought to inquire just what it is we are buying, at \$200,000 per mile together with the new and extensive damage to the forest, which

relegates two noteworthy park features to storage space in the museum. The old road is certainly inadequate. But it could very easily be improved moderately at a tenth of the estimated cost of the new road. On what reasonable basis should we exchange, at high cost and scenic sacrifice, a charming mountain road, built and functioning now both as an approach road and a road for display in a high-mountain park, for a road whose sole function is approach at speeds not considered desirable in the park?

Is there a demonstrated need for such a highway? If there is I have not been able to discover it. What has been interpreted as a demand is largely the result of misinformation by which tourists have been routed over No. 120 in the belief that it was not a mountain road, but a standard highway. Represent the road correctly on the maps and those who want speed, straight lines, and the monotony of 6-per cent grades will not select it. Those who select it will do so because they love the mountain road with its charm unchanged, and prefer it to the highway built for speed. The old road quite properly should be improved slightly, employing elastic standards made to fit the terrain; it can thus retain all its present delightful qualities. There will be little sacrifice of trees. There will be no new scars, or very few. The unique features along the seven miles will remain to be enjoyed by tourists, who presumably have come for the very purpose of seeing them.

Three compromise solutions are offered in the firm belief that we do not need high speed within the park, but that we do need display facilities:

1. Improve the present seven miles of the old road. A little increase in width is desirable to increase the sense of security of the driver. This need not be uniform and can avoid any extensive cutting of trees. Trim back a few of the headlands which now produce blind turns and anxiety, and widen the outside shoulder at these turns. Fill in some of the more narrow ravines to open the sharper turns. Soften one or two of the steeper grades. Smooth and repair the surface where that is needed. Otherwise leave the road essentially as it is. It has carried two-way traffic with only minor accidents for more years than most of us have lived; thus improved it could carry lots more. But correct the maps first of all.

Inform and educate the public by providing a real break at Carl Inn, where the Big Oak Flat highway would end and the park begin. It would be easy to develop here an attractive oasis, with facilities for rest such as at the Ash Mountain gate to Sequoia. A small branch museum could entice tired drivers to relax a few minutes. Its display might well be built around the two features ahead—the mountain meadow and the giant sequoias of Tuolumne Grove. An agreeable ranger could do a valuable

job in establishing good public relations here and could prepare the tourists for the kind of driving and the scenic features now to be looked for.

The tourist would then start up the grade after a pleasant break in his journey and a complete change in his mental attitude. The fact that he must now drive in second gear at twenty miles an hour would no longer be grounds for resentment. He would see and probably appreciate the splendid forest through which he moved at leisurely pace. At Hodgdon Meadow he might wish to stop, take pictures, look at the flowers, get a drink from the little stream that always flows there. He might even want to stop and eat his lunch at this delightful spot, as some of us often do now when we drive to the valley. This might be the first unspoiled mountain meadow he had even seen, with its lush verdure, its flowers, and its fine forest walls—the only meadow of its kind he'd have the chance to see. On the Tioga Highway, in Crane Flat, he would almost certainly resume fast driving, and the meadows there could hardly register as they flashed by.

Beyond Hodgdon Meadow the driver would find himself on the level, or even on a slight down grade, this too a pleasant change from the climb in second gear. A stop in the cool shade of the public camp, where the road crosses crystal clear Crane Creek. Or on the mile or two in second gear to the Tuolumne Grove with its dozen or more sequoias, and a stop to view them and refill the radiator if necessary. If the ranger was successful, the tourist would wish to spend some time here and walk about among the trees, just as did the stage-coach pilgrims a generation ago. Should he plan to leave the valley by No. 140, these would be the only sequoias he could see, perhaps his one chance in a lifetime. Rested and ready to travel again, he would move on up the two miles to the Crane Flat checking station, undisturbed by grades less steep than he found in San Francisco or Berkeley.

Professor George Stratton of the University of California once said, "We see what we wish to see." A personable ranger at the Carl Inn gateway can condition his clients to see in this seven-mile stretch many of the things for which the park was set aside. A western gateway on the Big Oak Flat Highway is a perfect set-up for this much needed educational work. Rangers, however, cost money; the park badly needs a larger quota, and the Park Service has no funds to pay for the increase. But how many rangers could be maintained on the difference between the cost of the proposed new highway and the cost of improving the old road? It is true that roads are built with separate funds. Nevertheless, the source is the same—taxes.

Instead of reaching the Crane Flat station fatigued and sometimes almost hysterical (this is happening now as a result of the misrepresentation provided by the maps), the tourist will be much more likely to arrive ready for the greater scenic wonders he knows lie just ahead. He will already be "sold" on the quality of his park, not soured, as he so frequently is today, and anxious chiefly to give expression to the bitterness of his complaint. For example, a car pulled up at Crane Flat last summer, the occupants tired and evidently much upset by the fifty miles of mountain driving they had unsuspectingly selected. When the ranger asked for the customary entrance fee the driver blew up. "Fee, Hell! I wouldn't pay a nickel to see your damned park." And turning his car around he drove on back the way he had come in.

A highway up Crane Creek would correct this situation. At what price?

2. Build the double-road facility similar to that described below for the twenty-one-mile section of the Tioga Highway. The present road, slightly improved, would be retained for eastbound traffic. The second member, built to similar standards, might well follow the route of the proposed Crane Creek highway. Outbound drivers are usually eager to get back quickly to their homes, their vacation being over. They could drive somewhat faster on the straighter alignment and more uniform grades of the highway route. Since the road would be of low standards it would do less damage than the highway. It would cost less, though the combined cost of improving the present member and building the new would be greater than that estimated for Alternative 1. The road would follow the terrain; it would be narrow, though wide enough for cars to pass; its grades need not be entirely monotonous.

3. The third alternative is based on the assumption that No. 120 will be an approach road all the way into the valley. It would diverge from the present Big Oak Flat route at Harden Flat, ascend the Crocker Ridge and follow it eastward past Hazel Green to the Fire Lookout, and so to Crane Flat. Much of this route is through an area of cut-over land and on or near a ridge top where the damage will be limited. It commands a superb view of the Sierra Crest from its higher points. Not being personally familiar with this route I cannot give a more detailed description of it. I am aware, however, that it has been considered by park officers and rejected, largely owing to the rugged character of Crocker Ridge and its ascent from the west. It would also require the approval of the State Highway Commission, which might balk at keeping two roads in condition—the old road, which serves Aspen Valley and Mather, and the new highway with its relatively heavy construction costs.

What the planned highway undoubtedly offers is a fast approach to the Tioga Highway and the Yosemite Valley. It passes through an outstanding section of virgin timber, and would cut a wide swath, involving the sacrifice of many fine trees. The tourist would see this forest as it flashed by, say at 50 to 55 miles an hour. He would catch no refreshing glimpses of the typical unspoiled mountain meadow, nor would he see a single sequoia. He could reach Crane Flat from Carl Inn in about fifteen minutes or less—if this should be of importance. On the Crane Creek road he would take half an hour, and might easily be tempted to spend more time on the way to see and enjoy the park. The new highway, with its single function, would increase populations both in Yosemite Valley and the High Sierra country to the east. It would provide one more valuable link in the transmountain highway.

Here we have a situation that is still within our partial control. We may decide to give the green light to the train of consequences which the trans-Sierra highway carries with it, and if we do our silence now gives assent to the program. If we prefer the more conservative solution which will keep our park more nearly unchanged, we shall need to make our preference known not only now, but also on any future occasions when we detect that more attention is being given to the plans than to the national parks.

Tioga: High Standards for the High Sierra?

MOST SIERRA CLUB members are familiar with the Tioga Highway—the spectacular western section ascending the north wall of Merced canyon, the twenty-one tortuous miles of old mine road between White Wolf and Tenaya Summit, the fast high-standard section again from Tenaya Summit to Tioga Pass. Those who drive it recognize the necessity for improving the old mine section at once. While perfectly safe (since one must drive it slowly) it imposes undue anxiety on the driver. The road is so crooked and narrow that opposing traffic often cannot be seen until it is upon one, and traffic can pass only at turn-outs. Too frequently the turn-out and the opposing car do not arrive at the same time. Backing the car in search of a turn-out can become a disturbing experience to one not accustomed to mountain roads. Cars get stalled now and then, and hold up traffic in both directions until they can be extricated. In its present state, the twenty-one mile section is indefensible and must be replaced as soon as possible. Present predictions are that funds will be available in 1950.

The objective sought is to provide reasonably safe and easy access from Yosemite Valley to the high country and Tioga Pass. Opinions will differ on what constitutes safe and easy travel. Three possible solutions present themselves however if we interpret the terms with some elasticity:

1. Complete the Tioga Highway as planned many years ago.
2. Improve the old mine road as it stands to the point where it will carry two-way traffic comfortably.
3. Widen and surface the present old mine road to about 13 feet and construct a similar road roughly parallel to it, of roughly the same low standards. Divide traffic into east- and west-bound.

Solution 1 has all the advantage of the expected. Since two-thirds of the Tioga Highway is built to high standards, this section will provoke neither thought nor question in many minds when it is completed to those same standards. It is favored by both the National Park Service and the Public Roads Administration. It probably will not be easy for them to change their positions. Nevertheless it deserves a moment's thought.

Of the three solutions, number 1 is by far the most expensive. It does the greatest damage to the natural scene. It invites speeds which are dangerous and at which little is seen except the road itself. (On the completed sections speeds of 45-70 miles per hour are routine; the park limit is 35.) It will promote crowding and overdevelopment in the Tuolumne Meadows region, just as happened in Yosemite Valley when effortless access was provided. It will complete the missing and critical link for a fast trans-Sierra highway which will serve not only park visitors, but the general business public which may need to cross the range, east or west.* It will thus postpone any proper improvement the state may otherwise be expected to make to provide such service when it is needed outside park boundaries—as, for example, over Sonora Pass on highway 108. Effortless driving for the park visitor at any desired speed, along with increasing use as a general public-service corridor through the park, will certainly produce some profound changes in a region whose chief charm today lies in its semiprimitive quality.

* The present construction schedules, subject to change in either direction, are: Twenty-one miles of Tioga Highway, 1950; Big Oak Flat Road (State Highway 120), conversion to highway, about 1955; Big Oak Flat section between Carl Inn and Crane Flat, conversion into highway to coincide with 120; Benton to Leevining, improved for fast traffic, 1948; Leevining grade 13 miles fair now, probably will be converted or improved as the other sections are completed. At a guess therefore, the trans-Sierra fast highway through the park will be complete in about ten years. Travelers between Salt Lake and the Coast on U. S. 6 will select the cool mountain route in preference to the heat of Mojave desert.

In answer to protests against building the standard highway which have come to the National Park Service, Mr. Thomas Vint, Chief Landscape Architect makes some significant comments: "The road as planned will be of a standard similar to those sections on either end and every precaution will be taken to insure a minimum of disturbance to the adjacent landscape." This is an official guarantee that the damage will be great. One needs only to take a look at the completed sections to see exactly how great it will be. The same precautions were taken, of course, when these sections were built.

On the problems of crowding and deterioration, Mr. Vint points out, with great restraint we feel, "While it is realized that the completion of this road will *materially increase the number of visitors and the attendant disturbance to the area adjacent to the road*, the surrounding untouched wilderness lying within the park boundaries is still available to those who desire the solitude of the primeval" (italics ours).

On the matter of cost, the comment of Colonel John R. White, for twenty-eight years Superintendent of Sequoia National Park, is particularly interesting. Colonel White refused to approve two standard-highway projects within his domain which were to replace old roads of low standards. He insisted on moderate and conservative improvement of the existing roads, made them adequate for their traffic needs and retained all of their original charm. "As to the Tioga Road unimproved section: \$20,000.00 a mile will fix the present section so that it will be 100 per cent better and meet all public demands or expectations. People are astonished at the magnificent highways we have built in the mountainous sections of the parks; rarely has there been any concerted demand for them. Spend \$20,000.00 a mile on improvements instead of \$200,000.00 a mile on new construction." (Personal communication.) This is of course an offhand estimate, but it comes from a long and strikingly successful experience in preserving park values while providing for present enjoyment of them. He did it by holding down road standards to the minimum for adequate functioning. This brings us to the second alternative.

Solution 2 would be the expected answer to the problem if the item cost and economy were considered of importance. By widening and improving the present road we could convert it into a mountain road of about the quality of the Big Oak Flat road between Carl Inn and Crane Flat, at the suggested figure of one tenth the cost of the highway. Like the Big Oak Flat road mentioned, it will be one of extraordinary beauty and charm. It will produce very little additional scarring of the scene. It will

wind, like a trail, with a variety of grades. It will indeed be an automobile trail through the forest; following contours; the trees intimately close and meeting overhead; providing vistas and close-up views of the very things the park was created to preserve and to display. In two respects it falls short of the high-priced highway. It does not invite to speeds above the park maximum, and it does assume that the driver can and will shift gears when necessary—just as he does in Berkeley or San Francisco every day. Do we really prefer speed and high-gear-only to charm and the speeds that disclose it, at the differential of \$180,000.00 per mile?

Solution 2 will not prevent the trailer village that Solution 1 will certainly bring in to Tuolumne Meadows. It will tend to keep it small, because of curves and grades. It will be a partial block against the general public-service corridor across the range and through the park. It will be also a practical deterrent against the more remote hazard of all-year use, because of the difficulty of plowing for two-way traffic on a narrow winding road. It will tend to protect the upper country against too-great or too-rapid population increases by permitting only relatively slow speeds and requiring moderate effort on the part of drivers.

Solution 3 has its own interesting features. It has all the advantages of Solution 2, except that it will cost more—though far less than Solution 1. It provides the ultimate in actual safety together with a complete sense of security for the driver. The two members of the double road may very well be out of sight of each other most of the way. Since the new member of the double road will be constrained by no rigid standards of grade or curvature, it too will follow contours. It will produce only moderate scarring and will not cut a wide open corridor through the forest as does 1. Driver adjustment from the fast tempo of the highway sections to the slower tempo of the double road will be made more easily and certainly than will be the case with solution 2. For most drivers, we believe the experience of traversing the twenty-one miles along a winding one-way road, through mountains and forests, secure in the knowledge that there is no opposing traffic, will be unique and most refreshing. It will provide a degree of mental calm and physical relaxation not possible in either of the other solutions. The road will be wide enough so that cars from the rear may signal and pass cautiously, and so that a stalled car may be backed into position where it will not block following traffic. It probably is the ideal park road for the functions of display, while at the same time providing for the necessary functions of approach.

Much detail has been omitted in this discussion in the interests of brevity. Mountain lovers familiar with this section of Yosemite Park will

easily be able to fill in the omissions. Perhaps the problem boils down to the answers to a few questions:

How necessary do we consider the provisions for speed in a park? What price are we willing to pay for it? Do we want gratuitously to provide a corridor across the sanctuary for nonpark uses? Is such a gratuity in harmony with the words of the Congressional Act? In permitting construction of the highway are we sidestepping our obligations as owners and trustees for posterity?

In the words of Dr. Elmo Robinson: "Shall we keep the plans and change the Park, or shall we change the plans and keep the Park?"

Sierra Snows—Past and Future

By WELDON F. HEALD

IN JUNE 1907 the weather observer at Tamarack, California, sent in his snowfall report for the past season to headquarters in San Francisco. It turned out to be a world's record which has never been equaled anywhere in the forty-one years since then. From September 1906 to June 1907 more than 73 feet of snow fell at Tamarack.

This station had just been established 8,000 feet up on the west slope of the Sierra Nevada in Alpine County, but Donner Pass, fifty-five miles farther north and a thousand feet lower had already reported seasonal snowfall totals up to 65 feet in 1879-80 and 1889-90. These impressive figures led to the belief that the Sierra was the world's snowiest region. Even solemn men of science wrote of Sierra snows in almost chamber-of-commerce superlatives. The classic monograph on the subject, published thirty-odd years ago began, "California, usually thought of as a land of fruit, sunshine and flowers, also has within its borders the region of greatest snowfall in the United States."¹

However, in spite of Tamarack's world record for one season, the Sierra in recent years has had to relinquish the snowfall championship. The establishment of weather stations in the Cascades has proved that range to have a higher average seasonal snowfall than any other area on earth where regular records are kept. Paradise Valley, on the southwest slope of Mount Rainier, has averaged nearly twelve feet more snowfall than Tamarack and more than fifteen feet greater than Soda Springs, near the summit of Donner Pass. And it is highly probable that Washington State's Olympic Mountains and the Coast Range of British Columbia and Alaska receive even more snow than the Cascades.

Nevertheless, the Sierra is still a strong contender for the snowfall title and may eventually be classed in second or third place. The accompanying table lists the North American stations which have recorded an annual average snowfall of 400 inches or more.

It is unfortunate that snowfall records in our Western mountains have not been kept with greater regularity. In fact, the above figures are so fragmentary that they cannot be directly compared. At almost every station the averages are for a different series of years and those with records of less than ten years have little but a very general value.

But the rather surprising fact that two Colorado stations received more

than 400 inches of snow in *any* period is interesting. It suggests that high areas in the western Rockies, such as the Bitter Root Mountains of Idaho, might rival the Sierra in snowfall.

HEAVIEST ANNUAL AVERAGE SNOWFALL
FOR STATIONS IN NORTH AMERICA

STATION	LOCATION	YEARS OF RECORD	SNOWFALL IN INCHES
Paradise Valley	Cascades, Washington	11	591
Crater Lake	Cascades, Oregon	12	516
Mount Baker Park	Cascades, Washington	4	478
Ruby	Rockies, Colorado	9	463
Tamarack	Sierra, California	22	451
Monte Cristo	Cascades, Washington	4	442
Musick	Cascades, Oregon	7	430
Glacier	Selkirs, B.C., Canada	5	414
Soda Springs	Sierra, California	78	409
Savage Basin	Rockies, Colorado	15	400

Then, there is one other mountainous region in California itself which undoubtedly surpasses the Sierra Nevada and equals the Cascades in depth of snow. The Salmon-Trinity Alps in the extreme northwestern part of the state receive such enormous winter snows that glacial ice is found the year round in north-facing cirques—yet the highest peaks are well below regional timberline. There is no surer indication of superlative snowfall than the presence of glaciers originating wholly below the limits of tree growth. This phenomenon occurs in but three other mountain areas in North America: the Olympics, northern Cascades, and the Coast Range of British Columbia.

So the snowiest regions on the continent are the Alaskan Coast Range, the higher mountains of British Columbia from the Pacific to the Selkirs and Purcells, the Washington and Oregon Cascades, the Sierra Nevada and Salmon-Trinity Alps in California, and perhaps some of the westernmost ranges of the Rockies as far south as Colorado. These are the areas which probably would be found to average seasonal snowfalls of 400 inches or more.

Of course, most of the earth's major mountain ranges are still blank spaces on the climatic map. Thus, there is always the possibility that the world's record for heavy snowfall may eventually cross the seas to rest on the summit of the Kurile Islands' Chachanobori or journey south across the Equator to the slopes of Chile's Mount Sarmiento. The New Zealand Alps, western Caucasus, and several high spots in Europe are

also to be reckoned with. But for the present, Paradise Valley appears to be the snowiest place on the face of the globe for which actual records exist.

FAIR AND WARMER?

When white-bearded natives tell us that Sierra snows were much deeper in the old days we are apt to attribute their statements to the lively, retrospective memory of the aged. But there is every reason to believe that the old-timers are right. Climatologists, meteorologists, and glaciologists are finding increasing evidence that the Pacific Coast, along with a large part of the world, is in a period of rising temperatures and decreasing precipitation which has lasted for nearly a century.

The story glaciers are telling us about this prolonged "heat wave" is particularly dramatic.² Throughout the world glaciers are now in full retreat, those in our western mountains perhaps fastest of all.³ Once glistening icefields have diminished to emaciated, shrunken remnants, while many smaller glaciers have completely melted away in the last quarter century.⁴ But the most significant fact about glacial retreat is that melting is proceeding at an ever faster rate.⁵ Icefields today are retreating twenty per cent more rapidly than they were fifteen years ago and more than four times faster than at the turn of the century. As glaciers exist mainly on a delicate balance between snowfall and temperatures, the present headlong retreat of the world's six million square miles of glacier ice indicates an accelerating rise in temperatures, decrease in precipitation, or both.

Recently the findings of glaciologists have been reinforced by a meteorologist. Mr. J. B. Kincer, formerly of the United States Weather Bureau, has plotted climate records from all parts of the world. His curves show that temperatures have been generally rising, while precipitation has lessened since the last decade of the Nineteenth Century. Some of Kincer's figures date back to the 1850's and indicate that world climate has been moderating ever since that time. His conclusions are that there has been a distinct yearly trend toward warmer winters and dryer summers.⁶

Certainly a tendency toward increasing dryness is discernible in many California precipitation records. In some cities, such as Sacramento and Eureka, even a layman can see the trend graphically illustrated. In others, particularly in the southern part of the state, no general decline in rainfall is evident. But one authority goes so far as to claim a decrease in the entire state's precipitation of fully eight inches from 1850 to 1930, and later calculations seem to show that the downward trend still prevails in spite of the wet period, 1935-41.⁷ Of northeastern California in the

past century Ernst Antevs writes, "Both the rainfall and [stream] runoff curves undergo a broad general decline to the present . . ."⁸

So climatologists, meteorologists, and glaciologists join the old-timers in agreeing that our winters aren't what they used to be. But so as not to be caught unprepared in a possible future deluge the cautious men of science qualify their statements. They unanimously point out that present "rainfall deficiencies may represent only the dryer portions of long precipitation cycles, and it is possible that the trend may turn and continue upwards for several decades."⁹

WERE PAST SNOWS DEEPER?

Is this period of decreasing precipitation reflected in the snowfall of the Sierra Nevada? Definitely, yes. A study of seasonal records shows that there has been a general falling off in the past fifty years from the maximum snow depths of the 1890s.

We are fortunate in having an unbroken snowfall record for the Sierra dating back seventy-eight years. In 1870 a weather station was established on the summit of Donner Pass where the newly-built Central Pacific Railroad crossed the mountains. Although the snow gauge has been moved twice, present Soda Springs, 6,752 feet elevation, is only three miles west of the original Summit station and 265 feet below it. For all practical purposes we can use the snowfall record as if it were continuous for one station.¹⁰

We present three figures based upon this seventy-eight year record: figure 1 is a smoothed curve of the seasonal snowfall from 1873 to 1946¹¹; figure 2 represents a ten-year running average—that is, each season is given as a mean of the preceding nine years and itself; figure 3 is a graphic representation of each season's snowfall, 1870–71 to 1947–48. These figures illustrate the trends of Sierra snowfall, each in its own way.

Figure 1 shows that from a low under 300 inches in 1874, snowfall generally increased for twenty-one years to a maximum of nearly 600 inches in 1895. After a series of heavy seasons, 1890–97, the curve takes a downward trend for twenty-eight years to a minimum of less than 280 inches in 1924–25. Another maximum of 480 inches was reached in 1937, after which the curve turns downward again to the present.

Figure 2 illustrates the same trends even more definitely. But since each season is the mean of ten, the highs and lows are delayed several years. For instance, the 1894–95 maximum of figure 1 shows up four years later, and the culmination of dry years falls in 1930–31 instead of 1924–1925. Again, the recent high comes in 1940–41, not 1936–37. However,

the significant fact to be gained from a study of figure 2 is that the recent maximum was the first major upswing in Sierra snowfall in forty-two years, but it was apparently only a temporary interruption in the long downward trend.

Two things lead to this belief: first, the 1932-1941 maximum averaged 434 inches for the decade, which was only 84 per cent of the 515-inch high reached in the period 1890-1899; secondly, the snowfall curve has rapidly declined since 1941 to a new low record of 336 inches for the period 1939-1948. This means that the past ten years have averaged less snow than any other decade since the station was established. Even the dry years 1922-1931 recorded a slightly higher average.

Figure 3, showing snowfall for individual seasons, bears out the same conclusions. It will be seen that seasonal snows of more than 700 inches occurred twice in the first twenty years of record, but not once in the last fifty-eight years; 600-inch snows fell in five seasons during the first thirty-seven years, but none have been recorded since 1906-07; 500 inches or over was attained twelve times in the first forty-one years, three times in the last thirty-seven years. And even 400-inch seasonal snowfalls are not so frequent as they used to be. There were twenty-two such seasons in the first half of the record, only fifteen in the last half—a decrease of 32 per cent.

All these figures seem to indicate that the Pacific Coast is still in a period of declining precipitation that was not halted by the last upswing. The 1937-38 seasonal snowfall of 597 inches, although the greatest in thirty-seven years, was not very impressive compared to the record falls of 776 inches for 1889-90 and the all-time high of 783 inches in 1879-80.

Decidedly, the old-timers did better!

CAN WE FORETELL FUTURE SNOWS?

From these records and curves extending back three quarters of a century, can we draw any conclusions about future snowfall in the Sierra? Certainly there is no method by any technique now known of predicting future climatic trends, shifts, and changes. But it is probable that broad guesses approximating possible conditions may be made for immediate future periods up to fifteen or twenty years. The method used, however, depends quite as much on horse sense as it does on pure science.

Such a forecast was made in the middle 1930s by Dr. Antevs and events have rather brilliantly borne out his predictions. Antevs conducted a remarkable research project in precipitation, stream runoff, and tree growth in the Great Basin. From 1931 to 1935 he obtained comparative

rainfall data running back to 1455 A.D. by means of the annual growth rings of trees and records of the varying lake levels in northeastern California and the Great Basin. These data he carefully correlated with recorded rainfall since 1850, and with figures for river-gauging stations.

As a result of his studies of past conditions Antevs projected his curves into the future and predicted in 1935 that "... there should be a water maximum in 1936 or 1937, then a minimum about 1948 or 1949, and finally an increase to another maximum in 1951, 1952 or 1953."¹² The first predicted maximum was realized in 1938 (shown on our smoothed curve as 1937) and, as far as the Sierra was concerned, resulted in the greatest seasonal snowfall since 1906-07. Those who went on the 1938 High Trip will remember the shining beauty of the peaks as well as the soggy discomfort of camping among melting snowbanks. The present minimum, characterized as "The Great Drought" by the ski-minded secretary of the Sierra Club, fulfills the second part of Antevs's prediction.¹³ Its low point was probably the season of 1946-47. There is every reason to believe that the next high in the early 1950s will also be realized.

For a study of Sierra snowfall curves reveals some rather regular, recurring highs and lows for the past seventy-eight years. Repeating periods of the same general phase are also indicated in Sacramento rainfall since 1850 and in Antevs' tree-ring and lake-level data extending back to the early part of the Nineteenth Century. So we can rely with some confidence on a general pattern of waxing and waning Sierra snowfall for over 135 years. From these various records we are enabled to make tentative predictions of what may happen in the next twenty years.

To begin with, Sierra snowfall records show some rather sharp differences from rainfall data from valley stations. For instance, the greatest maximum snows, 1893-1897, occurred during a moderate secondary high in Sacramento rainfall. Again, the recent state-wide precipitation maximum was of much longer duration than the snowfall high and topped out in 1940-41, a season of below-average snowfall at Soda Springs.

Although mountain snows and valley precipitation naturally show a general correspondence, the differences are sufficient to account for divergence in occurrence, duration, and emphasis of maxima and minima. For this reason we will disregard rainfall records and base our guesses on the Soda Springs snowfall curves since 1870. Before that date, of course, we shall have to rely on tree rings, lake levels, and Sacramento rainfall to 1850.

In our figure 1, the smoothed curve shows a recurring, short-phase period which is probably Douglass's "Hellman Cycle."¹⁴ It varies in

duration from three to seven years and averages 4.7 years. In a superficial, general analysis such as ours the multitude of so-called cycles in which present-day mathematical climatologists are entangled are not important. But we must consider this Hellman Cycle—if that is what it is—because it causes conspicuous humps on the shoulders of longer curves.

The next period or cycle which is noticeably prominent produces the major highs and lows on the curve. Its phase is 15,12,15,15 years with an average of 14.2 years. For identification we will call this "Period A." Finally, although possibly not evident at first glance, the 1895 and 1937 maxima appear to be culminations of a longer period which had a duration of forty-two years. We will check later for evidences of this "Period B" in Sacramento rainfall and the tree-ring records.

The absolute minima of Period A have a tendency to be displaced forward toward the preceding maxima if the general curve is ascending, and to be retarded toward the following maxima when the curve is declining.¹⁵ At no time does the absolute low occur halfway between the highs of Period A. Therefore it will simplify the discussion to consider our periods from maximum to maximum and leave the minima until later.

So on this basis, disregarding the Hellman cycle for the present, we have significant highs and lows in the Soda Springs snowfall curve as follows:

Period A	1880	1895	1907	1922	1937
Interval, Yrs.	15	12	15	15	
Period B		1895			1937
Interval, Yrs.			42		

Having discovered two rather prominent periods apparently influencing Sierra snows, let us look at Sacramento and the tree-ring records to see if these periods are apparent before 1870. The Sacramento curve shows a very pronounced high in 1867 which is also conspicuously evident in tree rings taken from Susanville, California, and Lakeview, Oregon. With the interval of 13 years from the high of 1880 it seems safe to consider 1867 as a maximum of Period A. The Sacramento curve shows another high in 1853 which is confirmed by Susanville tree rings as being the greatest since 1867. Before 1850, Susanville tree rings show further maxima in 1838, 1826, and 1811.¹⁶ The intervals between these highs are of the same order as those found in the snowfall curve, so we may consider that Period A from 1811 to 1937 varies in duration from 12 to 15 years and averages exactly 14 years.

For the continued projection of Period B into the past we appear to have

GRAPHS OF SEASONAL SNOWFALL IN SUMMIT - NORDEN - SOL SPRINGS

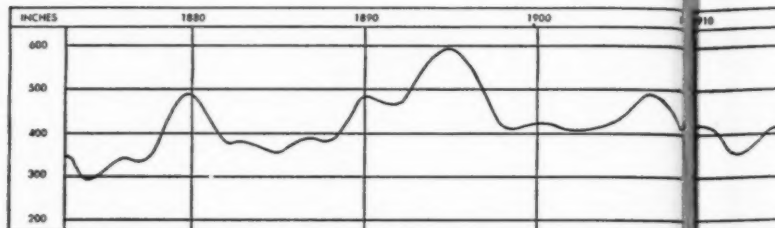


FIGURE 1—Smoothed Curve of Seasonal

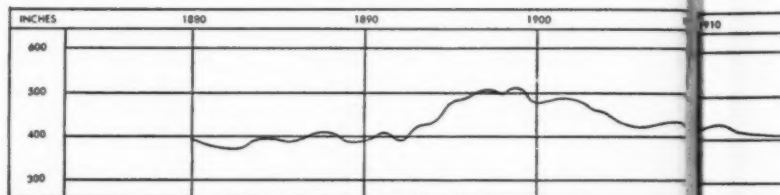


FIGURE 2—Ten-year Running Average Curve

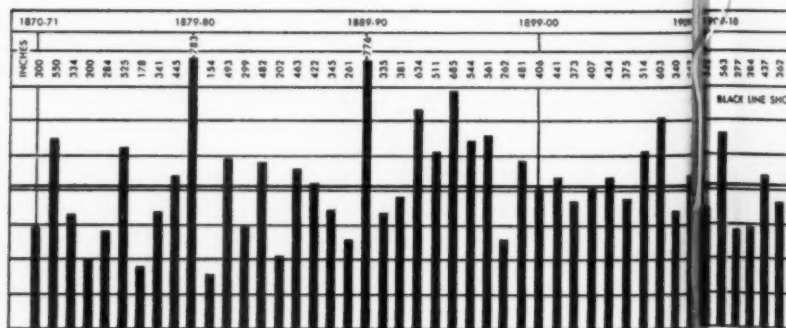
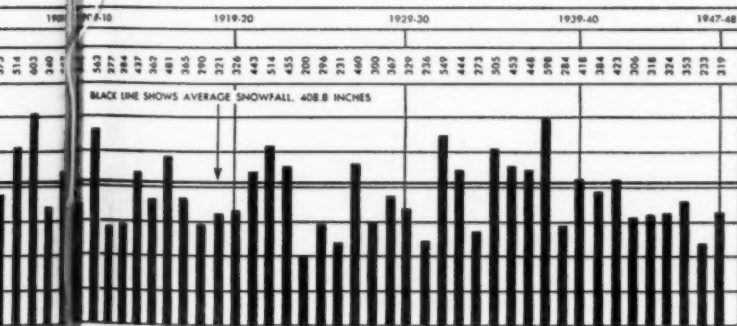
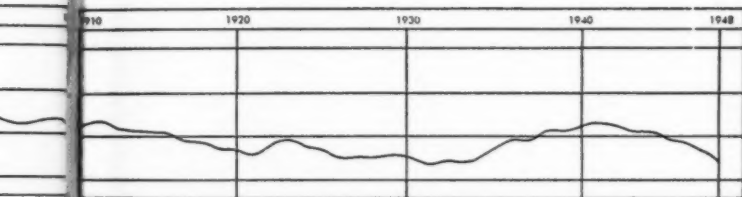
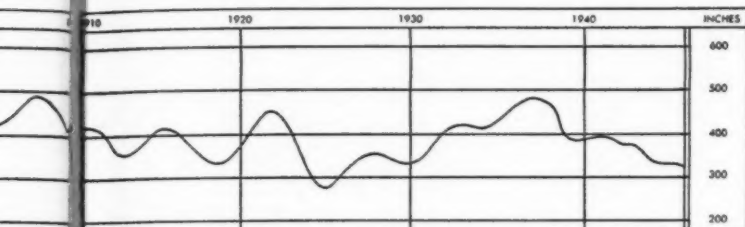


FIGURE 3—Seasonal Snowfall, 1870-1910

ANNUAL SNOWFALL IN THE SIERRA NEVADA
N-SIDE SPRINGS STATION, 1870 - 1948



Season Snowfall, 1870-71—1947-48

rather surprising confirmation from Sacramento rainfall and Susanville tree rings. The records show decided maxima in 1811 and 1853, which, added to the snowfall major highs of 1895 and 1937, give us a series with an interval of exactly forty-two years between each high. From this it would seem that every third maximum of fourteen-year Period A is a major high.

Developing this thesis in detail would be interesting, but space does not permit. The study of past droughts, floods, blizzards, lean and fat years is as fascinating as figuring out who-done-its. It is sufficient here to assume that we have a reasonably accurate record of the occurrence of important maxima extending back 137 years. Tree rings and Sacramento rainfall have added to our series of highs thus:

Period A	1811	1826	1838	1853	1867	
Interval, Yrs.	15	12	15	14	13	
Period B	1811 ¹⁶			1853 ¹⁷		
Interval, Yrs.		42			42	

Having gained a certain familiarity with Period A and some confidence in its behavior we have constructed Figure 4. It is a composite curve of the performance of Period A upon three different occasions, 1874-1886, 1902-1913 and 1919-1925. The climax periods of 1888-1902 and 1930-1947 were not used because, as major highs of Period B, they differ in having longer duration and double maxima. The three curve sections have been superimposed on one another with the highs of 1879-80, 1906-07 and 1921-22 as the common starting point, then the mean of the three curves plotted to the preceding and following minima. Figure 4 is our mainstay when guessing what may happen in the next few years.

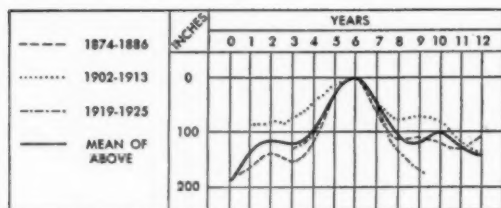


Figure 4. Composite curve of the performance of Period A

THE SHAPE OF SNOWDRIFTS TO COME?

We are now ready to make our tentative predictions about Sierra snowfall for the next twenty years. They are:

1. *The season 1948-49 should have a snowfall of between 450 and 550 inches.*

2. *The season 1949-50 is likely to have less snow—possibly between 325 and 425 inches.*

3. *The season 1950-51 should again be well over average.*

4. *The seasons 1950-51 through 1952-53 should show a total average well above normal.*

5. *The year 1952 should bring the heaviest season and culminate the maximum, but this might occur in 1951 or 1953.*

6. *A remote possibility exists that one of these three seasons will receive more than 600 inches. If not, one of them should go well over 500 inches.*

7. *The next minimum should occur in 1957 to 1960. This may be a period of even less snowfall than the present low.*

8. *The following maximum should occur 1965 to 1968.*

9. *The next general, long-range upswing, such as that in 1895 and 1937, cannot be expected to culminate until around 1978 to 1980.*

It will immediately be evident that what started out to be timid forecasts read like bold challenges. So we hasten to say that some of these predictions are certain to be wrong, and it is quite possible that all nine statements will prove to be hopelessly and entirely incorrect. But brash and presuming as these long-range forecasts may appear they are all based upon the past pattern of Sierra Snowfall and California rains for the past 137 years.

The bases for these predictions are very briefly as follows:

Forecast 1. The past six seasons, 1943-1948, have each had less than normal snowfall—two more than have occurred consecutively before on the record. This fact, and the operation of the Hellman Cycle, last top in 1944-45, should produce an above normal season (see also fig. 4).

Forecast 2. The Hellman cycle usually produces a secondary hump on the snowfall curve, so that the year following a Hellman maximum shows a slight decline as in figure 4. However, on a smoothed curve the secondary hump does not always show. So this prediction will be correct only if the rising curve follows the average closely.

Forecast 3. The Hellman Cycle halts the ascending curve only temporarily.

Forecast 4. According to the plotted averages in figure 4 these are the seasons which produce the Period A maximum.

Forecast 5. It is likely that the season of greatest maximum will come before that shown in figure 4. The year 1953 would give Period A a duration of 16 years from 1937, greater than any recorded in the past. Also the decline 1937-1947 is longer than the average, thus probably producing a shorter than normal rise to the next maximum.

Forecast 6. Every maximum of Period A has included at least one season of more than 500 inches snowfall and, up to 1906-07, produced a season of more than 600 inches. Unless our snows have declined below this possibility, such a heavy season is long overdue.

Forecast 7. This prediction is simply a projection of the averages shown in figure 4 and therefore may be as much as three years off. The reason the next minimum may be lower is the fact that 1947 is a retarded minimum characteristic of a generally declining curve.

Forecast 8. A further projection of period A to the following maximum.

Forecast 9. This is the next high of Period B, approximately 42 years from 1937.

Obviously, there is much further work to be done on Sierra snowfall. Dr. Joseph LeConte has kept a remarkable series of graphs on daily snow depths at Donner Pass since 1897 which deserves study, and the exhaustive research and field work of the Coöperative Snow Investigations now going on should produce abundant additional data.¹⁸

But if further surveys should prove conclusively that the Sierra Nevada is far from being the world's snowiest region, even if we must accept the fact that our snows are declining each decade, we will still agree with our editor—" . . . the Sierra will be the best known for the sheer joy of outdoor living that the Sierra alone seems to provide, because in winter as in summer, it is the Range of Light. And there will be light hearts in it too".¹⁹

NOTES AND REFERENCES

- ¹ Palmer, Andrew H., "The Region of Greatest Snowfall in the United States," *Monthly Weather Review*, May, 1915, 43: 217-221.
- ² Heald, Weldon F., "Our Vanishing Glaciers," *Nature*, to be published in 1949.
- ³ Heald, Weldon F., "We Live in an Ice Age," *Natural History*, Dec., 1941, pp. 296-302.
- ⁴ Phillips, Kenneth N., "Farewell to Sholes Glacier," *Mazama*, Dec., 1939, pp. 37-40.
- ⁵ Matthes, François E., Report of Committee on Glaciers, 1945, *Trans. Am. Geophysical Union*, Apr., 1946, pp. 219-233.
- ⁶ Kincer, J. B., "Is Our Climate Changing?" *Monthly Weather Review*, Sept., 1933, 68: 251-256.
- ⁷ Gray, L. G., "Long Period Fluctuations of Some Meteorological Elements in Relation to California Forest-Fire Problems," *Monthly Weather Review*, 1934, 62: 231-235.
- ⁸ Antevs, Ernst, "Rainfall and Tree Growth in the Great Basin," *Am. Geog. Soc., Spec. Pub. No. 21*, 1938, p. 3.
- ⁹ Wallace, H. A., "The Western Range," *Senate Doc. No. 199*, 1936, p. 141.
- ¹⁰ Felton, E. L., U. S. Weather Bureau, S. F., *Letter*, Apr. 29, 1948, "The record was made at Summit until July 1, 1926; then at Norden, about one mile west, until March 16, 1930; since then the record has been made at Soda Springs, approximately two miles west of Norden."
- ¹¹ This is known as a double-hanned curve. The snowfall total in inches for each season is weighted by the formula $\frac{1}{4}(a + 2b + c)$ where b is the season in question; a , the preceding season in inches and c , the succeeding season in inches. The entire snowfall curve has been smoothed twice in this manner.
- ¹² Antevs, *op. cit.*, p. 63.
- ¹³ Brower, David R., (a) "The Great Drought," *S.C.B.*, Jan., 1948, p. 3, (b) "The Great Drought: II," *op. cit.*, Feb., 1948, p. 3. These editorials started the idea of the present article on Sierra snowfall.
- ¹⁴ Douglass, A. E., "Climatic Cycles and Tree Growth," Vol. III, *A Study of Cycles*, Carnegie Inst., 1936, pp. 70 ff.
- ¹⁵ The phenomena of displaced absolute minima of Period A in the snowfall curve deserve further study. They might prove to be the means by which we could tell whether the general precipitation curve at any given time was increasing or decreasing. For instance, the minimum of 1947 was retarded by about four years from the average. This might indicate an over-all decline in snowfall until the next upswing of Period B in the early 1970s.
- ¹⁶ 1811, according to tree-ring records, was the greatest maximum since 1538-1540 A.D.
- ¹⁷ Antevs, *op. cit.*, p. 22, "On July 5, 1854, Honey Lake . . . measured about ten miles from northwest to southeast and stood a few feet below an old shore line. This is one of the highest levels it has reached since the white man came to the region."
- ¹⁸ LeConte, Joseph N., (a) "Snowfall in the Sierra Nevada," *S.C.B.*, June, 1908, pp. 310-314; (b) Ms. graphs of Summit-Norden-Soda Springs daily snow depth, 1897-1948.
- ¹⁹ Brower, David R., "Winter Sports," Chap. 6, *The Sierra Nevada: the Range of Light*, 1947, p. 238.

Still a Bugaboo

By ROBIN HANSEN

TO A TOURIST standing behind the great windows of the hotel dining room at Lake Louise it had been a dismal summer. To a climber in the Bugaboos this could hardly be surprising, for the weather which gets to the Lake Louise district is manufactured among the crags and spires of the Bugaboo mountains. There was seldom a day last summer that the Bugaboos were not covered by clouds.

We arrived at Spillimacheen, on the first of our lone three days of sunshine, to be greeted by one tenth of the population, Old Vic, ex-Swiss guide, inventor extraordinary, and self-proclaimed weather forecaster. "Looks like there might be a twenty-day dry spell," he said. This was exciting news, but later developments proved that he could well add another title to his array—optimist.

The day the eighteen of us left Spillimacheen there was nothing overhead but blue sky and a burning sun. The thermometer stood at eighty-six and our hopes at one hundred. The guidebook describes the road into the Bugaboos as "twenty-seven miles of abandoned road passable, with some risk, to a high-wheeled truck." Unfortunately, we found that they hadn't made trucks with wheels that high for years. But we found one.

We spent the first night near the abandoned cabin at the end of the road. Until dark there was little accomplished, for there were many trips to a small clearing where we could see the impressive face of Snowpatch. It seemed impossible that there was a route up this face, but Jack Arnold and Raffi Bedayn had made the first ascent in 1940, and we were eager to see if we, too, could trace out a route. There are many other fine peaks in the district—Bugaboo, Pidgeon, Crescent, and Brenta Spires,—but Snowpatch was, as Conrad Kain said, "the prize of the district." He went on to climb many other peaks, but the memory of Snowpatch never left him. When he died, one of his last requests was that a picture of the mountain be sent to his home with the notation, "The peak that Conrad could not climb."

With the thought of Snowpatch to fortify us, we made an early rising, divided the equipment and food, shouldered the inevitable packs, and started up the three thousand feet of moraine to our base camp. According to Bugaboo lore, no one has packed into the base camp in good weather, and at the halfway mark we were no exception. The rest of the

climb was in the rain. When we reached base camp at timberline, it was immediately apparent that there was not going to be enough room for all the tents to be pitched on level ground. It was a case of first come, first served, and it was a tribute to the ingenuity of the late-coming women that they were able to hack out enough level ground for their tents.

That night plans were drawn up for a one-day snow-and-ice school, where the novices would get a chance to see how basic rock-climbing techniques can be adapted to snow and ice. When the alarm went off at five in the morning, it was not too difficult to leave the sleeping bag, for the air was already warm from the early sun. Practice was held on the tiny glacier at the base of Snowpatch. Oscar Cook took the group for more advanced practice that afternoon, while Phil Bettler, Paul Estes, Jim Wilson, and I decided to try Bugaboo Spire. By the time we had reached the top of the Bugaboo-Snowpatch Col we had all become artful dodgers, for the gully was a channel for a continuous barrage from the unsound rock above.

Here crampons and ice axes were exchanged for Bramanis and ropes, for we were at the base of the mountain. The first thousand feet or so of Bugaboo is nothing more than a talus grind, but near the top, where the ridge narrows down, we came upon the expected Gendarme. After spending some time looking over the formidable left side of it, we stumbled onto the route. Two pitons and an airy traverse later we were over the pitch. This traverse is rather remarkable in that Kain climbed it in 1916 with nothing more than a rope for protection. He called it the most difficult pitch he had ever done, and though it is now almost in the easy-day-for-a-lady class, it was a remarkable accomplishment at the time.

From the summit we surveyed the entire region, from the Bobbie Burns group to the Rockies that form the east side of the Columbia River Valley. The few clouds which appeared from time to time would vaporize and disappear, leaving the day as perfect as they had found it.

A few hundred feet above the Col we joined up with Phil again. He had dropped out earlier owing to an upset stomach, due, no doubt, to his cooking of the previous evening. We returned to camp in time to join in the supper that night and in the plans for the next day. Phil Bettler, Demetra Corombus, Sylvia Kershaw, and Sherman Lehman were to try the Marmalada; Rolf Pundt, with Bob Becker, Ian MacKinlay, and Anne "Cricket" Strong were going to attempt Bugaboo; Jim Wilson, Millie Jentsch, Ed Seaman, and Ray de Saussure were to make the long trek to Pidgeon; Paul Estes and Morrie Fiksdal were to try Crescent Spire; and Oscar Cook, Bill Long, John Thune, and I chose Snowpatch.

We were the first party away in the morning and from our position at the base of the rock we could see the other parties start for their peaks. By noon we had covered the most of the easier pitches below the prominent snowpatch and were eating lunch above Wiessner's overhang. By the time we had climbed three hundred feet of the friction slabs beside the snowpatch, we knew that we were not going to make the top that day. To the west there was an ominous-looking black bank of clouds, and far to the south there were occasional flashes of lightning. Within twenty minutes of our first sight of it the storm hit. At one o'clock that afternoon we turned back. In fifteen minutes it was impossible to imagine that it had ever been warm and sunny, for it was raining, hailing, and snowing in repeating cycles. We were soaked to the skin, and downward progress was agonizingly slow. What had taken but a few minutes to climb took nearly an hour to rope down. Thunder rolled around incessantly, and at least one stroke of lightning hit the mountain. The storm stopped as suddenly as it had started and we were becoming half-inclined to begin climbing again, when a glance to the west showed another bank of clouds as discouraging as the first. The rear of the first storm wave revealed a solid bank of cumulo-nimbus shoulder to shoulder, stretching far to the south. The first wave was leaving and the second approaching at an estimated fifty miles an hour or greater. We redoubled our efforts to get down, but the second storm caught us just above the overhang. From here down, the rappel positions became harder to rig, and our retreat was slower still. At eight that evening we were at our cache of ice axes, dry boots, and socks. We could look down on the approach route to Bugaboo Spire and were puzzled to see two people walking arm in arm, supporting each other. We yodeled, but received no sign of recognition except a slight pause and glance in our direction. We made for camp as fast as we could and were met a little distance away to be told of an accident to the Bugaboo party. Lightning had struck the peak while they were taking refuge in a cave just above Kain's Gendarme. Rolf was dead. There was a chance that Becker was still alive in the cave, and Cricket and Ian were badly burned.

John Thune was soon busy with the first-aid burn ointment, sulfa drugs, and sedatives. His skill in using these, as well as the nembutol and penicillin, proved to be invaluable and drew high praise when we finally reached a doctor some days later. While John was dressing the burns, Ian related the story of the accident, an account reconstructed here:

"We were on the first summit at noon and were about to start across

to the second when we noticed a storm building up in the west. By the time we were ready to start across, the static electricity had built up such a charge that sparks were beginning to fly from any point in the vicinity and then from our fingers. Of course, the other summit was now out of the question and we immediately rigged a rappel and started down. By the time the clouds were overhead, we were ready to start down the gendarme. We noticed a small cave here and decided to get into it and off the ridge, as we had heard that danger from lightning is increased on an exposed ridge.

"We were reaching in the rucksacks for some lunch when the next thing I knew I was sprawled out on the rock, paralyzed from the neck down. I could speak, but could move nothing. I saw Rolf, half standing, half squatting, near the edge of the ridge. I yelled to him, but he apparently could not hear me. He gave a convulsive leap, rolled down the ridge and off the edge. Shortly after, Bob and Cricket regained consciousness. Cricket seemed to remember nothing, but was not paralyzed. Bob did not recognize anything or anyone and lapsed into unconsciousness again. My paralysis was leaving little by little, and I could now use my legs and one arm. At this time, the storm passed over and the sun came out, but I could see a second wave approaching. I tried to get Beck to wake up, but he remained unconscious. I felt that if we did not get away from the summit before the next wave hit, we would lose any chance we had of getting down alive. I decided to take Cricket down and get help for Beck. I directed Cricket to tie him to the rock with our sling rope, to prevent his sliding off the edge.

"We were below the Gendarme before the next wave hit, and roped down the few remaining pitches to the talus part of the ridge. At the top of the col, we picked up our ice axes and crampons and started down. Near the top, Cricket caught a crampon and fell headfirst down the steep slope. She was stopped by a pile of rocks two hundred feet below. Her ice ax and glove had been torn from her hand, but she was not seriously injured. We continued down and reached camp without further mishap."

Only the bare facts were put forth by Ian, and there is more to the trip down the ridge than is related. Rappelling over first-degree burns is not a simple thing. Ian did not have the full use of both arms and Cricket was still somewhat stunned. That they were able to get off the mountain in their condition is a tribute to fortitude, clear thinking, and no little heroism.

We were now faced with the problem of getting a party with food and

warm equipment to Becker. Phil Bettler and Paul Estes volunteered, and they were soon loaded up with a sleeping bag, a primus, prepared tea, morphine, penicillin, and burn ointment. The weather outside had not changed; it would intermittently rain and snow, but the threat of lightning was gone. There was little chance that they could climb the Gendarme at night in a storm, but we felt that they must try. They left at nine-thirty that night. Four more of us were to leave at five the next morning to reinforce Phil and Paul, for they had no sleeping bags for themselves and no food for a prolonged rescue attempt.

The rain and snow had changed the camp into a sea of mud, everyone's clothing was wet, and there was little chance for drying it. The women volunteered to stay up all night in shifts, keeping the fire going and drying as much of the wet clothing as they could. The atmosphere was a gloomy one, but the spirit and coöperation shown by the entire party did much to help lift it. The Pidgeon Spire party was still out and we now had the additional worry that they might also have been struck by lightning during the storm. It was nearly midnight when they dragged into camp. They had been forced to take cover in a cave near the top of Pidgeon in order to wait out the first storm. They had had an experience with sparks jumping between their heads and the top of the cave, but were uninjured.

We awoke the next morning to find the camp hemmed in by a gray horizon, with intermittent rain and snow. As we were getting up Phil and Paul returned with the news that they had been unable to get farther than the base of the col. They had bivouacked, waiting for the weather to improve; when it was evident that it was not going to, they decided to return to camp. They reported a foot of new snow at the col, and that the storm was worse higher on the mountain. The gloom settled tighter around the camp as we waited for a break in the weather.

At noon the next day, the clouds lifted in the lower portions and we felt that we could search for Rolf's body on the Warren Glacier side of Bugaboo. We traversed the entire west side of Bugaboo and found only one possibility—a huge sloping ledge, some five hundred feet above the glacier, which would apparently stop anything falling from the vicinity of the Gendarme. The same day, those who were not drying clothes went down the moraine to cut trail for Cricket and Ian. On the chance that the storm would lift on the following day, plans were made to have Ray de Saussure and Ed Seaman walk the thirty miles to Spillimacheen and have a truck come in for the injured. By that time we hoped to be able to get across the Gendarme to Becker and to have news one way or an-

other. If we needed more help the truck would be there to get it. At the same time four of us were to start up Bugaboo and the rest would help Cricket and Ian down to the cabin at the end of the road.

The morning was foggy but gave promise of clearing. Except for Bugaboo, the peaks could be seen from time to time. Bill Long, Paul Estes, Jim Wilson and I started at nine in the morning. We made good time to the top of the col, but a short while later Jim dropped out because of a bad knee. We waited to see him safely down the col and on his way back to camp, and then resumed the climb. The easy scrambling of four days ago was made somewhat difficult by the new snow and bitter cold. We could see the gendarme, a hundred feet above, through the swirls of mist and snow, and it appeared unlikely that we could make the crossing. Bill and Paul anchored into a sound belay position; I went up and placed two pitons and, a little higher, pulled up onto the sloping traverse. It was clear of snow and covered with a thin film of water-soaked lichen. If the next four feet could be done the climb would be made. I inched a foot out on the face but came to the conclusion that the hold I had used previously was no longer there. As I started to retreat I caught sight of a slumped figure some fifty feet higher. Another glance showed that it was tied in to the rock with sling rope. It was Becker. When I reached Bill and Paul at the belay position, we held a conference on the possibility of getting across to him. Bill offered to try, and was soon at the crux of the pitch out of sight. After a long period of hesitation, the rope started to run out and I heard the cheerful sound of a ringing piton from the far side. A few minutes later we were on the steeply sloping floor of the cave, next to Becker. He was in the position in which Ian had described he had left him and the food bags were untouched; we could only conclude that he had never regained consciousness. We made preparations for the evacuation and when we were ready, we cut the sling rope. Evidently there was more tension on the sling than we had thought, for the body immediately started to slide, out of control. It gathered momentum and disappeared from view.

Bill and I held a short service there for Bob and Rolf, and then roped down to join Paul at the foot of the Gendarme. We reached camp late that afternoon and gave the news to the others. The news from their end was better; the injured were at the end of the road in good condition and the rest would be ready to break camp in the morning. On the following evening we arrived at the road and boarded the truck. We propped Cricket and Ian, whose recovery was now well under way, among the dunnage and bounced down the narrow road.

The Echo Lake Avalanches

By RICHARD M. LEONARD

THE WINTER of 1947-48 was one of the most unusual in the recent history of California. Until the coming of the storms of the vernal equinox, the season had been the driest in a great many years. Week after week of glaring sun from a cloudless sky had reduced the normal pack of about eleven feet to a densely compacted mass only five feet deep.

The day after the sun crossed the equator I was at Donner Pass testing a group in cross-country skiing. As we climbed upward across the moderate slopes of compacted snow we noted particularly the smooth icy surface. Our steel edges could hardly cut deeply enough into the surface to get a good grip for climbing. Heavy clouds were rolling in, driven by a wind of increasing intensity. The wind increased steadily as the clouds got blacker, and by 5 P.M., March 23, the first snow of a great storm started to fall just as we completed the testing tour and returned to Clair Tappaan Lodge. That night the violence of the storm shook the large building; the wind increased to nearly full gale intensity, with a velocity of 44 miles per hour recorded by early morning of the 24th. The clouds were heavily loaded with moisture. That night the snowfall was in excess of an inch per hour. The temperature dropped to 24° F. All day of the 24th the storm continued to rage, wind velocities of 40 miles per hour or higher being recorded. By 11 A.M. of the 25th, when the storm finally broke at Donner Pass, 24 inches of new snow had fallen since 8 A.M. of the 24th. This snow was cold; the temperature had dropped to -1° F.—33 degrees below freezing.

To those at the Lodge who were experienced in avalanchecraft, this snowfall was cause for concern. It had fallen at low temperatures; it had been driven by a high wind onto an extremely compacted, smooth and icy base already deep enough to smooth out all inequalities of the ground surface that might tend to support a snow load; all in all, the snowfall meant ideal conditions for high-velocity powder-snow avalanches.

Thirty miles to the south of Donner Pass and about 500 feet higher in elevation lies the granite-bound basin of Echo Lake. There in Pleistocene times a glacier at least a thousand feet deep carved a series of lake basins almost on the very crest of the Sierra Nevada. On the northern face of Mount Ralston tributary glacierets carved a few steep cirques. At the point of contact with the main glacier several hundred feet above

the surface of the lakes, frost action and plentiful rock at the edge of the glacier provided a cutting action which had oversteepened many of the gullies of the north face of Ralston Ridge. For centuries in the last cold fluctuation of the climate of the Sierra Nevada since the retreat of the major ice fields, avalanches had shot down several of the gulleys of Ralston Ridge clearing out the larger timber and leaving a mat of low-growing brush which attested the power of the avalanches to destroy all that attempted to project above the normal snow level.

Late in March, 1948, near the base of one of the largest of these avalanche gulleys, John J. Gregg, his wife, and their four children were enjoying the comfort of a snug cabin while a severe storm raged outside. They had gone in to their cabin under a brilliant sun, skiing over the icy crust that had resulted from weeks without a storm. They had hoped to enjoy a full week of the children's Easter vacation at this cabin. But now one of the children was not well. Realizing that the storm was steadily increasing in violence, they reluctantly decided to take the children out before the snow became too deep for easy travel, even on skis, and before the storm should be so intense as to make it unwise to travel with a sick child. They accordingly left their cabin safely behind them at about 2 P.M. on the 24th.

Across the lake, Jean Landre, the Water Master for the Pacific Gas and Electric Company who controlled the level of the lake, was contentedly weathering the storm, as he had done for many years. Even in his stout cabin he could feel the constantly increasing shock of the storm. By late afternoon of the 24th the violence of the storm, together with the snow falling from the black clouds overhead and the snow swept off the other peaks and brought to the old glacier basin of the Mount Ralston ridge, made it impossible to see any longer, even across the lake to the Gregg cabin, only half a mile away. Both Landre and Haven Jorgensen, owner of the Echo Chalet at the lower end of the lake, noted the extremely heavy snowfall, the low temperature, and the high wind accompanying the storm. Jorgensen reported that the first day of the storm deposited more than 36 inches of new snow on the level at his snow gauge. Landre reported a windstorm of the order of 50 miles an hour. All the afternoon and night of the 24th the storm continued with such violence that those living at the lake could hear only the beat of the wind against the buildings and the surflike roar of the storm through the trees.

It was therefore a great shock when the storm moderated the morning of the 25th for Landre and his wife to look out and see the Gregg cabin in shattered pieces scattered halfway across the lake toward them, as

well as to see several other cabins blasted by some violent force unseen and unheard during the height of the storm. The Ralston Ridge had unloaded its new burden of powder snow. Because a child had been ill, no one had perished.

ANALYSIS OF THE CAUSES

Our own cabin having itself just escaped, I was interested in looking over the havoc as soon as I could. What I had thought would be a sight-seeing ski tour soon developed into a careful study well worth reporting in some detail. For the results of the examination* have shown that the effect of wind in connection with these powder-snow avalanches was exceedingly and surprisingly important.

In the first place, the gale swept the extremely heavy fall of low-temperature powder snow from several square miles of the southwest slopes of the Ralston Ridge. This snow, along with at least three feet of fresh snow that had fallen throughout the vicinity, was deposited on the northeast face of the Ridge, in the wind shadows, or lee pockets, of the prevailing winds, pockets which accounted for the small tributary glaciers in the glacial age. Those slopes had already been oversteepened by previous glacial activity, had been cleared of most of their timber by repeated avalanching in the last few centuries, and were now heavily overburdened with an excess amount of cold new snow on an unusually smooth and icy base. Einar Nilsson, who has had a great deal of experience with avalanches, inspected these avalanches with me about three days after they fell. The break where the new snow had slid away on the icy crust beneath had a vertical wall seven feet high. This showed the tremendous overburden of snow brought by the violence of the windstorm onto this icy slope. At least one million and a half cubic feet of snow were involved in each avalanche.

Moreover, the breaks occurred about 100 feet up into the forest above the open slopes that have been kept clear of tree growth by repeated avalanches through the years. The slope of this forest is quite steep, but its density is such that it would normally be expected to hold the snow in place. The trees in the forest were not damaged, which may suggest that the main avalanche break was initially on the steeper slope below the forest and that the snow in the forest, robbed of support from below, sloughed off slowly in subsidiary slides. The moral would seem to be that

* Four trips to the lake were made after the avalanches came down. The last trip, July 3-5, gave me an opportunity to check the evidence under summer snow conditions. It was clearly shown how most of the evidence disappeared, making late observations rather futile as compared with those made during the storm and two or three days after it.

a skier must use care when crossing above an open-slope area subject to avalanching, even though the snow he is on seems well anchored by trees.

In the second place, it was probably the wind force of this exceptional storm that set the avalanches in motion. Because of the violence of the storm at the time, it was impossible for the residents at the lake to see the actual start or fall of the avalanches. The violence of the wind was so great that they could not even distinguish the higher velocity wind blasts of the avalanches except as increased gusts in the course of the general storm. The increasing overburden of the accumulating snow itself as it was eroded by the gale from the southwestern slopes and deposited on the northeastern slopes finally reached a point where the coefficient of friction of the new snow was not enough to hold the overburden any longer upon the smooth icy surface beneath. The wind pressure itself, moreover, beating in its turbulence upon the overburdened slopes of wind-compacted powder snow, several hundred thousand square feet in area in the track of each avalanche, could easily have been enough to release this overburden.

In the third place, a powder-snow avalanche destroys through the force of terrific wind blast. To understand this thoroughly one must have some knowledge of the mechanics of avalanches.

One of the accompanying photographs, although taken in the Alps in 1931, is almost a perfect illustration of the wind blast of the Echo Lake avalanches as they descended with tremendous velocity upon the lake. At least one million and a half cubic feet of snow fell in each of the larger avalanches at Echo Lake. That amount of snow when released upon an icy surface averaging close to 45 degrees would drop with high velocity, driving nearly that much air ahead of it and drawing that much again into the vacuum behind it. Moreover, careful physical studies in the Alps have shown that the snow involved in such avalanches will frequently have a density of 0.25 before the avalanche and 0.50 after the avalanche. This has been interpreted by some European authorities to indicate that part of the wind blast of such avalanches is due to the release of this additional air—one-half the total volume of the avalanche—as the moving snow compacts.

Seligman* shows speeds of 110-217 miles per hour for powder-snow

*The best authority in the world on avalanches; author of *Snow Structure and Ski Fields* (London, 1936), the result of many years of intensive research, primarily in the Alps, together with the best information published throughout the world. Brought up to date and summarized in *The Alpine Journal*, November, 1947 (56, pp. 120 ff. illustrated).

avalanches on 44° slopes. On the other hand, a wet-snow avalanche, which destroys by crushing trees, buildings, and all that lie within its path, has been reported as moving only 17 miles per hour on a slope of 45°. Seligman says, "The slowest moving avalanches are those of damp snow—the fastest of dry powder snow . . . the smoother the underlayer and the less encumbered the avalanche track, the faster it will run; also, of course, the steeper the slope the faster it will run. Large avalanches, other things being equal, are faster than small ones . . . the most destructive avalanches are those which cause a high wind; it is the wind that causes more material damage than the snow. Everyone has seen trees snapped off near their tops like carrots, at heights where the snow has never reached. Avalanche blast can travel great distances . . . its power is almost unbelievable. Lunn describes (in *Alpine Skiing*, page 45) how at Gletsch a large section of an iron bridge weighing several tons, was thrown *upwards* about 150 feet."

Seligman then goes on to describe a particular powder-snow avalanche which was closely observed. It fell about 900 feet, slightly less than the larger Echo Lake avalanches. Seligman writes, "An immense snow eddy rose up after it passed, followed by a noise as though a current of wind was overtaking the avalanche, and with tremendous speed this reached the valley in front of the snow. The air movement could be followed by watching removal of snow from the trees, some of which bent, while some snapped off."

Seligman then cites the German expert Welzenbach, who "points out that an avalanche which pulverizes completely will develop into an enormous cloud but one lacking density, and therefore at a slower speed so that it will not cause much blast. Also that an avalanche completely without pulverization will naturally displace but little air. It is the avalanche that pulverizes moderately which is responsible for the biggest blast."

The Echo Lake avalanches exactly meet the conditions of this last sentence. The force of the gale had been sufficient, even in the whirling eddies, to compact the new fallen snow to such an extent that cubes 6 feet on the side had slid twenty or thirty feet without breaking up. Even two-thirds of the way down the avalanche track blocks 18 to 24 inches in diameter were common. None of this material, however, reached the tip of the avalanche track, on the flat ground at the edge of the lake, where the cabins were.

Seligman goes on to say, "From what we have seen of the rough compilations of the speeds of avalanches, which may exceed an average of

200 miles per hour, it is not so hard to realize the power of avalanche blasts, for a hurricane which will wreck a city seldom averages more than 80 miles per hour."

EVIDENCE OF WIND BLAST AT ECHO LAKE

For the sake of brevity, I will tabulate some of the evidence which shows that the destruction was caused by high-velocity wind blast from powder-snow avalanches rather than by the crushing power of the snow itself.

1. Branches were broken off of many trees 20 to 30 feet above the ground. The snow level never did exceed 12 feet even before the avalanche started. A bugle was found hanging from a limb 12 feet above the ground; the cabin it had been in was destroyed.

2. At the edge of Dartmouth Cove the guest cabin belonging to Dorothy Riebe was blown off its foundations although it stood on a rock cliff well above the snow level of the avalanche. There was no heavy deposit of snow against the uphill side of the cabin.

3. The motor shed belonging to Fred Spiess was blown upside-down from its location on a granite ridge 25 feet above the snow level of the avalanche track.

4. The 8-foot steel water tank serving my cabin and Spiess, and an 8-foot outhouse belonging to Arthur Fawkes, were heavily blasted by wind and moved from their foundations although they also stood more than 25 feet above the avalanche gully.

5. I was particularly careful in my examination of the damage in the last three sites since my cabin was in a hollow protected by the granite ridge upon which the three structures were standing. Branches of trees were deposited by the avalanche blast far beyond the three structures on the ridge but owing to its protection in diverting the wind blast upward, my cabin was not touched. I noted with particular interest concerning the cause of the destruction that there was no substantial amount of additional snow near any of the three structures which would indicate that they had been pushed over by snow. All snow that existed there was such as would have settled from the snow cloud that would accompany a powder-snow avalanche. This is also confirmed by an examination made the day before mine, and only two days after the avalanches.

6. There were no snow blocks near any of the cabins that were destroyed in any of the avalanches at Echo Lake; all such blocks had stopped at the point where the avalanche gullies flattened out just above the location of most of the cabins. In this connection it should be noted

that an extra overburden of snow was deposited, after the wind blast, in the Dartmouth Cove area.

7. The Gregg, Tibbetts, and Wentworth cabins were shattered so thoroughly by the avalanche blast that only a narrow tongue of finely shattered debris remained.

8. This debris was stretched out 125 yards beyond the foundations of some of the cabins.

9. The debris was on top of the snow, there being only a light fall of snow back onto the debris. This clearly shows that the destruction was caused by the force of a high-velocity wind and not by the crushing power of snow.

10. A delicate phonograph was lifted by the wind and deposited on top of the snow 100 yards from its original location in the Hoyt cabin. It was picked up the day after the avalanche in perfect condition.

11. The Hoyt cabin was also dramatically deposited by the wind on top of the snow. The roof was on its side overhanging the flat surface of the snow toward the avalanche track. There was no substantial amount of snow newly deposited under the roof. This shows clearly again that the building landed there upside down on the snow through a clean force not involving the pressure of the snow itself. If a wall of snow had crushed the building and pushed it over, that snow would have buried the building, or at least would still have been resting against it. The evidence is entirely to the contrary.

12. The floor and foundations of both the Gregg and the Wentworth cabins were in perfect condition. The walls had been snapped off at the floor line. There was no crushing, general movement of the snow. The saw horse was not moved.

13. A line of trees, partly between the Gregg cabin and the avalanche track, completely protected the Einarsson cabin from the avalanche. The photograph from the Alps shows the rolling turbulence set up by a high-velocity air mass. The wind blast of this avalanche *jumped* the trees and destroyed the cabin on the other side. The same thing occurred in the destruction of the upper story of the Baker cabin halfway between that avalanche and those of Dartmouth Cove. There, the roof and the wall away from the avalanche were lifted into the air and deposited in among a small grove of trees about 100 feet away. The wall toward the avalanche was intact. Trees all around the cabin were untouched. Any general crushing snow movement would have had to take out that wall and the intervening trees. Only through the unpredictable turbulence of a high wind can this selective destruction be explained.

Seligman, in his discussion of the causes of avalanches, says, "A change in the direction or intensity of the wind may have a definite effect on the safety of a slope. If a slope which had been in the lee of the wind and had received a heavy surplus accumulation of snow, were suddenly exposed to a full blast, its whole equilibrium might be disturbed."

Seligman then quotes two Continental authorities: "As a rule, some powerful external impact is necessary to start an avalanche. Of such impacts wind is the most dangerous as suddenly a blizzard may convert a valley. . . . into a veritable death trap."

CONCLUSION

These excerpts from Seligman, as well as the Echo Lake observations reported, cast the wind as a winter-time villain to be reckoned with by the skier—much more of a villain than he may have realized. Wind builds up unstable snow slopes. Wind can shake them loose. Of greater importance is the concept of a snow slope not only as water in storage, but also as wind in storage; for once the powder-snow slope loses its equilibrium and starts its swift descent, a tremendously destructive, pent-up force may be turned loose.

The skier can find little solace in what these observations imply. He should not become so concerned with the indirect danger from wind that he overlook the direct danger from sliding snow—particularly from a lethal wind-slab slope on the move. Nor should he conclude that the wind, being just wind, need cause him no physical damage. A gale that can tear a cabin apart will do him no good; moreover, the dense cloud of snow dust accompanying the wind is believed to be capable of killing, perhaps of suffocation.

There is also a sobering lesson in this respect for the person who would build a mountain cabin or resort. It is well that such person consider the avalanche history of his building site—both the history recorded on paper and the history clearly marked in the forest and on the ground for whoever takes care to read it. It is then not enough merely to build out of the avalanche's path; avalanche blast must also be avoided.

Unfortunately, if one thing has been made clear at Echo Lake, it is this: avalanche blast is not very predictable; its capacity for damage is not very legibly written in the ground cover; it can obliterate a man-made cabin and leave trees standing all around it, only slightly the worse, perhaps, for the pruning.

Ancient Landscapes

By RICHARD M. LEONARD*

WITHIN the last year the people of the world have been thrilled by the discovery of the dawn redwood. In a remote valley of Central China a forester was amazed to find living trees of the *metasequoia*, a genus considered to have been extinct for many millions of years, but still closely related to the California *sequoia sempervirens*. When the reports reached the United States, Ralph W. Chaney, paleobotanist at the University of California, immediately flew to Chungking and then made the slow trip on foot to the valleys where the first of the trees had been found.

There he found not only vigorous specimens of dawn redwood but, almost equally interesting, found them growing in association with the same forest that left its fossil leaves throughout Oregon and California 15,000,000 to 40,000,000 years ago. He was thus able, in the Year of Our Lord 1948, to walk among birch, chestnut, sweet gum, beech, oak, katsura, and the dawn redwood, a forest with essentially the same association as the Arcto-Tertiary Flora which had its origin in the far north at the end of the Eocene Epoch, 40,000,000 years ago. Most of these genera disappeared from California and Oregon long ago, but in the remote valleys of China one can still see a portion of the forest of the earth as it existed so many millions of years ago. Fortunately, even in China a "Save-the-Dawn-Redwoods League" of leading scientists and scholars has been formed to protect the best of these trees with a national-park status.

In the High Sierra that forest no longer exists. We can, however, have the thrill of finding small portions of the landscape that are almost exactly as they were 40,000,000 to 50,000,000 years ago when those forests were in their prime farther north. The Sierra Nevada by that time was a somewhat elderly mountain range. The earlier parallel ridges of folded sedimentary rocks had gradually been eroded down to the bare granite, leaving the major streams in broad valleys still holding the southeast-northwest trend of the ancient parallel folds. The landscape of this epoch in the Sierra Nevada 50,000,000 years ago seems to have consisted of broad valleys, gently sloping hills and a few rounded, moderately mountainous summits such as Mounts Conness, Dana, Darwin, and Whitney, rising 2,000 to 4,000 feet above the adjacent valley floors.

* I wish gratefully to acknowledge the writings and teaching of the late François E. Matthes as the source of the geomorphology discussed here. R. M. L.

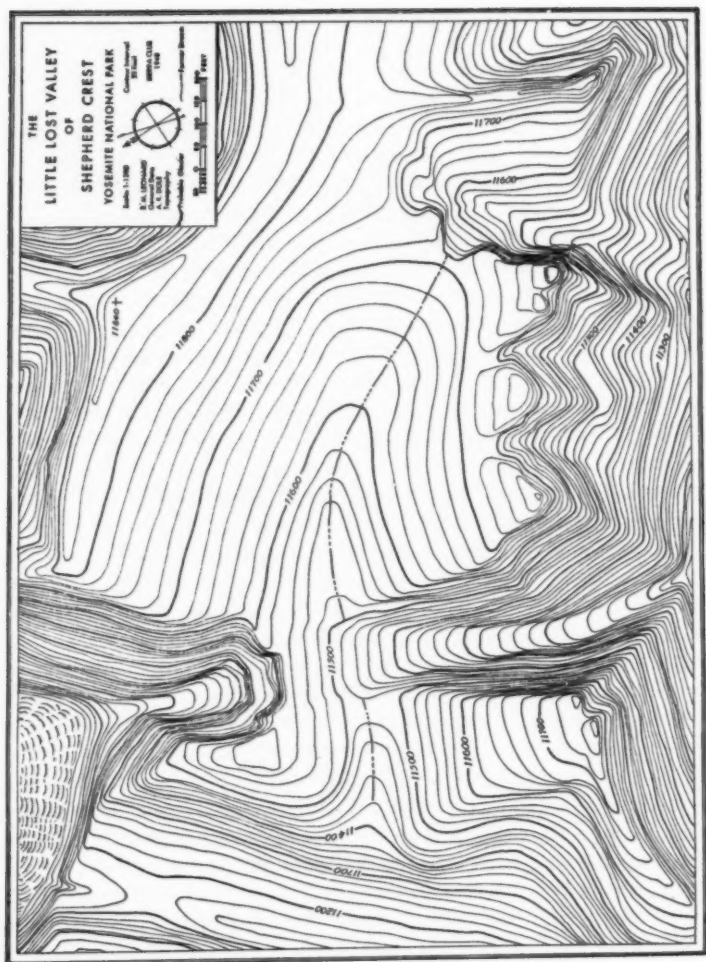
Gradually the Sierra was upwarped, acquiring for the first time a definite southwest slant, with a profound change in the direction of the master streams. By the second half of the Miocene Epoch—roughly about 12,000,000 years ago—volcanic activity and earth movements began again on a vast scale. Strong faulting took place along the eastern edge of the range. The Sierra crest was raised to nearly twice its previous height, attaining an altitude of probably 7,000 feet at Mount Lyell.

For millions of years the new southwestward-flowing streams had the opportunity to capture the waters of the other streams whose cutting power had not been increased by the southwest slope of the great fault block. These streams had ample time to widen broad valleys and level out the land into the gently sloping plateaus such as exist on both sides of Yosemite Valley, and on both sides of the Grand Canyon of the Tuolumne.

At the end of the Tertiary Period, the Pliocene Epoch of rest and ever widening valleys came to an end. The beginning of the Pleistocene Epoch, about 1,000,000 years ago, saw the greatest series of faults and uplifts in the long history of the Sierra Nevada. The eastern edge of the great block was raised almost to its present great height. The streams formerly meandering gently across the broad valleys were thus given greatly increased cutting power. As raging torrents they cut great canyons, leaving the broad floors of the valleys as gentle plateaus above the narrow v-shaped gorges.

A new power of erosion now came into play. Gradually the climate changed until the first of the great ice-age cycles produced vast ice fields that extended in powerful ice streams as much as sixty miles in length. As Muir so aptly expressed it, the power of snowflakes, falling gently one by one, cumulated to a force that ate out great steep-walled cirques at the headwaters of the streams, smoothed and refashioned the landscape, and carved the v-shaped Pliocene gorges into broad u-shaped glacial valleys such as those of Yosemite and the Kern. So recently have the last of those ice fields melted away—probably not more than 9,000 years ago—that erosional processes since then have in many places not even been able to remove the shining glacial polish, disturb the lines of moraines, or fill the glacial lakelets. We therefore now find our Sierra Nevada with almost the same surface it had at the end of the great ice ages, several thousand years ago.

With such a picture of the history of the rather active Sierra Nevada, one can realize that it would be quite unusual for any of the original landscape of 50,000,000 years ago to have survived to the present day. The erosive power of water and ice has carved great canyons more than 5,000 feet deep in some of the toughest of granitic rocks. And yet, quite a num-



ber of these primitive landscapes can be recognized in the Sierra, even by an amateur geologist.

In 1932 I had the good fortune to spend ten weeks in most of the Yosemite High Sierra with the late François E. Matthes, then senior geologist of the U. S. Geological Survey, who, better than any other man, was able to read the story of the Sierra Nevada and tell it to others. In the course of that study of the high country he recognized a remarkable bit of the ancient Eocene landscape: a tiny *valley* high up in the air, cut off on all sides by steep cliffs 2,000 to 3,000 feet above the adjacent terrain. It was the "Little Lost Valley of Shepherd Crest," just three miles north of the broad plateau of Mount Conness.

He asked me, as President of the Cragmont Climbing Club, to lead a small party up into the remote little valley to determine facts concerning its glaciation. On July 20, 1932, I started up the logical route over Point 10,087 and up the southwest ridge to the lip of the gentle little valley where it abruptly cascades into the steep cirque of a still-active glacier. There I was quite chagrined as a rock climber to be stopped completely on an easy Class 2 route (requiring no rope) by a 15-foot overhang cut so sharply into the farther end of the ridge that it was not possible to see the overhang from below. The sides of the ridge on each flank of the overhang are so steep that even a further examination in 1948 leaves doubt whether a route easier than Class 4 (requiring rope and belays) is possible at that point.

The view of the Little Lost Valley, only 30 feet away, more than made up for the inability actually to get there. From the information obtained at that time Matthes prepared the fascinating article published the next year.* On July 13, 1933, Beverly Blanks, Kenneth May, and Elliot Sawyer, all members of the new Rock Climbing Section of the Sierra Club, made the first ascent, via one of the steep avalanche chutes on the south. Two years later, on August 13, Sawyer repeated the climb with William B. Augustine while both were making forest-type surveys for the National Park Service. On August 1, 1939, Carl W. Sharsmith, Sierra Club member and ranger naturalist, made a solo climb in preparation for a trip from Saddlebag Lake on August 7, 1940, when he brought his wife and 10 others to the summit, 7 others reaching the valley. On July 5, 1941, the fifth ascent was made by W. Ryland Hill and Chas. W. Chesterman up the steep Class 3 northeast ridge.

The "Little Lost Valley" was then left to itself again until Al Dole and

*Matthes, François E. The Little "Lost Valley" on Shepherd's Crest, *S.C.B.*, 1933 18: 1, 68-80.

I reached the upper end on July 31, 1948, via the upper Class-3 avalanche chute. I was anxious to recheck the observations of 1932. It was therefore good to confirm how accurate the Matthes article was. A comparison of the Matthes sketch map of 1932 with Dole's pacing and clinometer map in the accompanying figure shows the principal difference to be a curve of the ancient stream bed from the south, both ends being beheaded, or cut into, by the steep avalanche gullies working up from the rather powerful glacier formerly cutting out the basin of the eastern McCabe Lake.

Accompanying photographs clearly show the nivated slopes of granite. To Matthes, this was one of the most important features of the valley. For with its favorable situation for formation of a glacier (a sizable snowdrift existed in 1948 near the upper end, with an extremely active, newly-discovered glacieret in the deep cirque below the lower end), the total absence of evidence of glaciation within the valley strongly supported Matthes' view that most of the high summits of the Sierra had never been glaciated. The pockmarks of solution pockets contrast strongly with the smooth surfaces of fractured or polished granite in areas elsewhere that have been glaciated. The granite surface of the Valley appears to have fractured into blocks of rather uniform size, that very slowly disintegrate into sand. The only evidence of transportation of materials within the Valley is the rather slight accumulation of sand in the bottom of the ancient stream-worn *v*. There was no evidence of important soil flow. We did note one block of granite, about two by three by six feet, that had somewhat of a surface polish. It appeared to be the result of faulting, however, rather than glaciation. Clear evidence of vertical fault-movement slickensiding was noted and is shown in a third photograph, taken at the top of the avalanche chute that cuts into the head of the valley. That photo also dramatically contrasts the gentle northwest slope of North Peak, a portion of the Eocene landscape of 50,000,000 years ago, with the nearly vertical cliffs of the cirque cut by the glaciers of the last 50,000 years or so. The 1948 bergschrund at the head of the newly formed Conness Glacier lies just above. The Little Lost Valley of Shepherd Crest is of the same age as the gentle landscape of North Peak across the way.

This tiny valley is a bit of fossil scenery antedating the origin of man, plucked at but not destroyed by glaciers that have come and gone since man first appeared on this world. Now it is in a national park, protected by man from himself, so that future generations of our civilization may be able to see what a segment of the earth was like long ago—when the ancestor of a tree that still prospers and reproduces first showed its green to the sun.



The Little Lost Valley of Shepherd Crest. (*Above*) Looking down the valley, where gentle slopes of granite sand contrast with the right-angled slash of an avalanche chute. (*Below*) Looking back up the valley from across the chute. By Alfred Dole.



Ancient Landscape on North Peak, Mount Conness in right background. Taken from at the top of the avalanche chute at the head of the Little Lost Valley. By Alfred D. Cook.

Ancient Landscape on North Peak, Mount Conness in right background. Taken from at the top of the avalanche chute at the head of the Little Lost Valley. By Alfred Dief.



Matthes Crest, Yosemite National Park. By Reid Moran.



A Children's Burro Trip. Part of the cast. By Alfred Dole.

A Children's Burro Trip

By HELEN AND ALFRED DOLE

THAT CHILDREN can withstand the rigors of trail life and even thrive on it, is attested by the records of the wagon trains which made their way westward in the late 1840s and the '50s. There were more children than adults on the Donner Party, with heroic stories being recorded of the courage and bravery of these unfortunate youngsters. More recent experience with children in the High Sierra is described by Daniel H. Condit in his article "Babes in Sierra Land" which appeared in the 1948 annual magazine of the *Sierra Club Bulletin*. Richard M. Leonard in a previous trip to the Yosemite High Sierra took along his two daughters, aged six and eight, and their nine year old friend, Elsbeth Foster. Their trip and the knowledge gained on it provided background for and inspired the larger trip on which the following experiences occurred.

The trip was planned to include four families, the Stewart Kimballs and the Brent Innans of Orinda, and the Richard Leonards and Alfred Doles of Berkeley. Elsbeth Foster was again a guest of the Leonards, and Suzanne Farquhar joined them too. In addition to being a vacation for the parents, the trip was to provide firsthand experience with children on the trail, doing their own hiking, sharing in camp duties, living on camp food, sleeping without shelter, and playing in the mountain environment as they found it. There were eleven children in the party, nine girls and two boys ranging in age from four and one half years to twelve.

Although there are children under four and one half in two of the families, they were left behind. Their parents felt that the dependence of these small children on the adults for everything from toileting and dressing to feeding and transportation would restrict the freedom of the whole group unnecessarily. Even the five and six year olds had to stay in camp while their mothers and fathers went on the longer side trips. These side trips were possible only because there were four sets of parents on the trip. There always seemed to be at least one of the fathers or mothers who preferred to stay in camp and look after the small children. The presence of four families on the trip offered other advantages. There were always children of the same age to play together in camp and on the trail. Many camp activities were much more fun when shared by more than just one family. The campfire especially benefited, becoming the focal point at the end of the day.

The itinerary was scaled down to what appeared to fit the ability of the average child to enjoy. The distance traveled on any moving day averaged three or four miles and never exceeded seven. The move was planned to be completed shortly after noon and preferably before lunch time. Starting from Snow Flat on the Tioga Road the route went first down to Tenaya Lake and then up the McGee Lake trail a mile and a half to the first campsite on a granite bench above Murphy Creek. The second day's journey was to Glen Aulin where the first layover brought welcome relaxation. From Glen Aulin the route lay up Cold Canyon to a campsite just below Elbow Hill. Next day the party journeyed on to McCabe Lakes where three delightful days were spent in hiking to interesting near-by points, playing, and resting.

From McCabe Lakes an interesting cross-country hike led to a point on Conness Creek just above the junction of the two main branches. Originally the plan had been to camp at a small lake shown on the topographic map occupying a small basin on the North Branch of Conness Creek. Unfortunately this lake does not exist. A larger lake above the timberline, not shown on the map, lies in a spacious cirque northwest of Mount Conness and forms the source of the North Branch. This appeared too barren to provide pleasant camping for a large party. From Conness Creek the route was again cross-country to Young Lakes where another three days were spent. The final day's trip was down trail to Tuolumne Meadows, and then home.

Two full weeks were taken for the trip, allowing ample time for the leisurely moves planned for the sake of the children. The actual experience on the trip indicated that the short hiking period on moving days was well adapted to the attention span of youngsters. The interest in hiking of the younger children could not be held much longer than through the morning. If the party got started by nine, at ten some child was sure to ask, "How far is it now?" or "When do we get there?" This seemed to indicate boredom rather than fatigue, though fatigue was more important in the first few days of the trip than later. Occasionally trail games were invented, such as the time when the children played "Bambi," running on ahead of the adults.

As the youngsters became hardened to trail hiking their complaints were noticeably reduced. With greater stamina they were less aware of their own fatigue and consequently became more interested in their immediate surroundings. Later in the trip Kathy Dole summed up her hiking experience by remarking, "I just had to get used of it."

Early in the trip it was found that the children traveled best in a group.

It became the practice for one or two of the mothers to round up most of the children as soon as possible after breakfast and to start on while the remainder of the party broke camp and packed the burros. On the moves of the first week it was easy to overtake the party of youngsters in an hour or so. Later, however, the children, even the youngest, might arrive at the next camp ahead of the pack animals. The party traveled as a group whenever the route departed from the established trail.

The arrival at a new campsite invariably signaled a complete rejuvenation of the children. Even the youngest of the party, Charlotte Kimball and Genese Inman, got over the worst of their fatigue after lunch and perhaps a short nap. All became interested in exploring the new environment. New games were invented to fit new features offered at each stop. Each new campsite seemed to be a new world to the youngsters. The features were at once strange, yet familiar, as they were composed of similar elements. Each had its rocks, trees, and water, and each its small or large meadow. However, these were never in the same proportion nor arranged into the same topography. These variations stimulated young imaginations to invent fascinating games, each one a blend of their civilized home life and their out-of-door surroundings.

The children started to explore each of the campsites soon after arrival. The camp and its environs were soon as familiar as the yard at home and the adjacent sidewalk and street. Some of the bolder youngsters would venture a little farther, yet not too far. On one expedition Charlotte and Genese came across a small cave. On being asked if they went in they answered they had not because of the "butler". "And what are butlers?" they were asked. "Why 'butlers' are deer with horns!"

After familiarity with surroundings was established, or often before if the stream was especially attractive, all put on their swimming suits or just stripped to the bare essentials to splash and play the rest of the afternoon. A small sandbar in the calmer shallow waters of the Tuolumne River below Glen Aulin was reshaped into a broad flat plateau by a dozen small hands. Sand castles with green moss lawns and tunnels underneath dotted the sandy shore of Young Lake. A favorite sport, especially of George Kimball, was catching a few of the dozens of small frogs and pollywogs which inhabit the quiet meanders of the meadow streams. Streams seemed always to need boats to sail down to the sea—anyway as far as the next fall or rapids. The older children exhibited more than usual skill in whittling boats from bits of wood or bark. Whittling was extended to other enterprises than just boats. Clever hands and ingenious minds fashioned totem poles, arrows, tomahawks,

and papoose dolls from handy sticks to use as presents and favors for Frances Leonard's ninth birthday party. These were carved with an assortment of jackknives and decorated with bits of string, cloth, or feathers. The older children invented an ochre or brownish yellow dye, made from decayed wood and water, for coloring their papoose dolls.

Many of the incidental features of the campsites offered opportunities for play. A large windfall at Glen Aulin became a steamship touching at distant world ports, while a high block of granite caught in a moraine at Young Lake was an airliner flying across land and sea. Another fallen pine balanced over a couple of low rocks made an effective teeter-totter at McCabe Lake. Still another, firmly anchored at the large end with the tapering top horizontal but free of the ground, made an excellent springy hobby horse, burro blankets serving as saddles.

Riding was not limited to imaginary steeds. Several of the burros were patient enough to permit children to ride bareback. These long-ears would browse with a lively burden on their backs as well as without. Some of the children became very fond of certain burros and made regular pets of them. The burros too learned that sugar lumps could be had from these children and would come right into camp looking for a handout. Even the best and mildest of burros is not always trustworthy, and everyone learned to respect them when working or playing nearby.

Another, and perhaps the most fascinating activity, was playing in the snow. Small residual banks occur in the summertime on the north-facing slopes of the glacial cirques in which many of the small High Sierra lakes are to be found. Here also are some of the best campsites, which are never more than a half hour's walk to a snow bank. Sliding, either afoot or sitting down, was a favorite sport. Making little snow men was a natural diversion with the essential material at hand. John and Brenda Inman were leaders in snow games as they had lived in the Midwest where snow was common.

The activities of the youngsters were never limited to the more immediate and practical use of the opportunities for play. More imaginative games were often created, inspired by special features of the environment. The meadow in Cold Canyon suggested a stage with scenery on which was danced a High Sierra Ballet. The meadow with surrounding forest was a natural setting for "Red Riding Hood" which the children presented for their parents at campfire.

Campfire was always a delight. A ring of sleepy faces with rosy cheeks lightened by the bright flames made a glowing picture before bedtime. Marshmallows were toasted, or more often burned, and traditional camp-

fire songs were remembered. The younger children soon learned them well enough to join in the singing. Instead of songs, Frances Leonard occasionally told stories.

All these activities contributed to the growth of each of the children. However, not all the time was devoted to more energetic play. There were quiet moods too, when the child observed his surroundings. Each one experienced many moments of real wonder as he looked around him at the beautiful mountain scenery. There is no doubt that each child did notice his surroundings and feel a great deal according to his age and ability.

Age influenced their interests to a large extent. The four, five, and six year olds, always lovers of animals, were keenly interested in the pack burros. There was a good deal of conversation and many questions about them. Deer were seen often enough to make everyone learn something of their habits. There was a moment of intense excitement for everyone when a small faun was discovered hidden beneath a log. Smaller animals were harder to see and not as tame as they are in the public campgrounds and consequently they elicited less comment.

Next to the animals, the water was a constant source of wonder and joy to all ages, but it too was only partly comprehended by the youngest children. The White Cascade at Glen Aulin formed a living backdrop to the campsite there. Kathy Dole asked from the depths of her sleeping bag, "Will the waterfall stay on all night?"

The older boys and girls were definitely aware of their surroundings. Not often did their reactions take words but at times they did. A typical example of growing awareness is the question of Suzanne Farquhar after a more critical look at a high bluff of roughly stratified granite just west of Glen Aulin: "Is it made of wood?" Having no experience with perspective her next question was, "How tall is it? Is it as tall as a tree?" The tendency in all their reactions was to describe the new in terms of past experience. Instead of saying "Our beds are on one side of the trail and our commissary on the other," Kathy described the camp at Glen Aulin rather succinctly by saying "Our camp has a bedroom, kitchen, and hallway!"

A budding sense of humor was often exhibited in the observations of the youngsters. Whether spoken consciously or unconsciously, it was wholly spontaneous and always delightful. Occasionally this crystallized into a definitely premeditated joke as when Elsbeth compared the color of one of the men's beards to the pinto burro by bluntly remarking, "You have a pinto beard!"

Not only were small minds stimulated through activity and observation but other experiences combined with these to influence character. The duties of camp life had to be shared. Dishes had to be washed and clothes cared for. Hair still had to be brushed and teeth scrubbed. Neatness in camp is as important as neatness at home, and sleeping bags and personal belongings had to be aired and straightened. In all these house-keeping chores the seven year old girls, Seeley Dole and Betty Leonard, were especially helpful. When camp was broken all debris had to be disposed of, and everyone joined to get rid of cans, bottles, and whatever else remained from our and previous campers' activities.

For each child there came a time of trial when loneliness, or fear, or confusion possessed their minds. Usually the child himself rose above the situation and found, as a result, new powers within himself. Occasionally the help and encouragement of parents was required. One child feared the burros; it wasn't until several days had gone by that she brought herself to feed the animals from her hand. Another child feared being left alone in her sleeping bag while the grown-ups were lingering at campfire; a firm attitude on the part of the parents, coupled with the child's own natural fatigue, soon brought complete repose.

On layover days short walks were taken, usually over gentle territory, but occasionally across more challenging terrain. In meeting and successfully negotiating these more difficult routes each child grew in courage and knowledge. Twelve year old John Inman climbed from Young Lake to the top of Mount Conness without noticeable effort. With all the children the natural mistrust of unknown and misunderstood mountains was replaced with a new feeling of kinship to them as they slowly conquered some of the mysteries of the Sierra. These and many similar experiences contributed to both the spiritual and mental growth of the children. By the end of the two weeks new confidence, greater independence, and increased poise were demonstrated.

With so much activity going on it would seem that young appetites would increase to astounding proportions. The commissaries (each family had its own supplies and cooked separately) were planned on the basis of this assumption. It was surprising, then, when it developed that most of the young people ate no more than they did under normal circumstances. However, when it came to drinking, a different story can be told. Prodigious amounts of lemonade made from citric acid, sugar, flavoring, and water were disposed of, supplemented by copious amounts of stream water. Although powdered milk was available, the children cared little for it, either mixed with water or as hot chocolate. Plenty

of milk in the form of soups, sauces, and in baking was consumed, making up any deficiency which might otherwise have developed.

Standard camp menus were used for all meals, and were found to be ample from all viewpoints. Special foods or dietary supplements, such as some form of vitamins, were not considered necessary as both enriched white flour and whole wheat flour were included in all the food lists. These combined with other cereals and a few fresh and dehydrated vegetables, canned and dried meats, bacon, margarine, peanut butter, ample amounts of dried fruits, nuts, candy bars, and any other delicacies that enterprising planners dared to pile on the backs of their groaning burros, provided a thoroughly balanced diet. Meals were made more interesting for young appetites with the help of small reflector ovens in which biscuits, corn bread, and even birthday cakes were baked.

Clothing, too, was restricted both in amount and selection to that which could be carried by the burros along with the food, bedding, and cooking equipment. For daytime wear it was reasonably loose, cool, and durable. Each child had a pair of jeans, T-shirt, and light underclothes. Some of the girls wore seersucker dresses or skirts as a change from shorts or jeans and found them even more comfortable on the trail. A cotton or wool flannel shirt was added for evening warmth. A light sweater and waterproof windbreaker were also essential for both early morning and cool nights. Two pairs of well-fitting shoes were of prime importance. Both ankle high and oxford types of leather or canvas were worn. Rubber soles were a definite advantage for climbing on rocks and fallen logs. A single change of clothing was adequate since layover days came often enough for frequent laundering. An extra couple of pairs of socks were a good idea as trail dust dirties them faster than any other article of clothing.

Flannelette night clothes were worn in order to help keep the sleeping bags clean, and all the children were comfortable even on the coldest night. Usually no other shelter than the sleeping bag was necessary—on our trip there was no rain for the two weeks—but summer storms in the Sierra are not infrequent and light tents were carried for such times. The tents were used for mosquito protection rather than for rain.

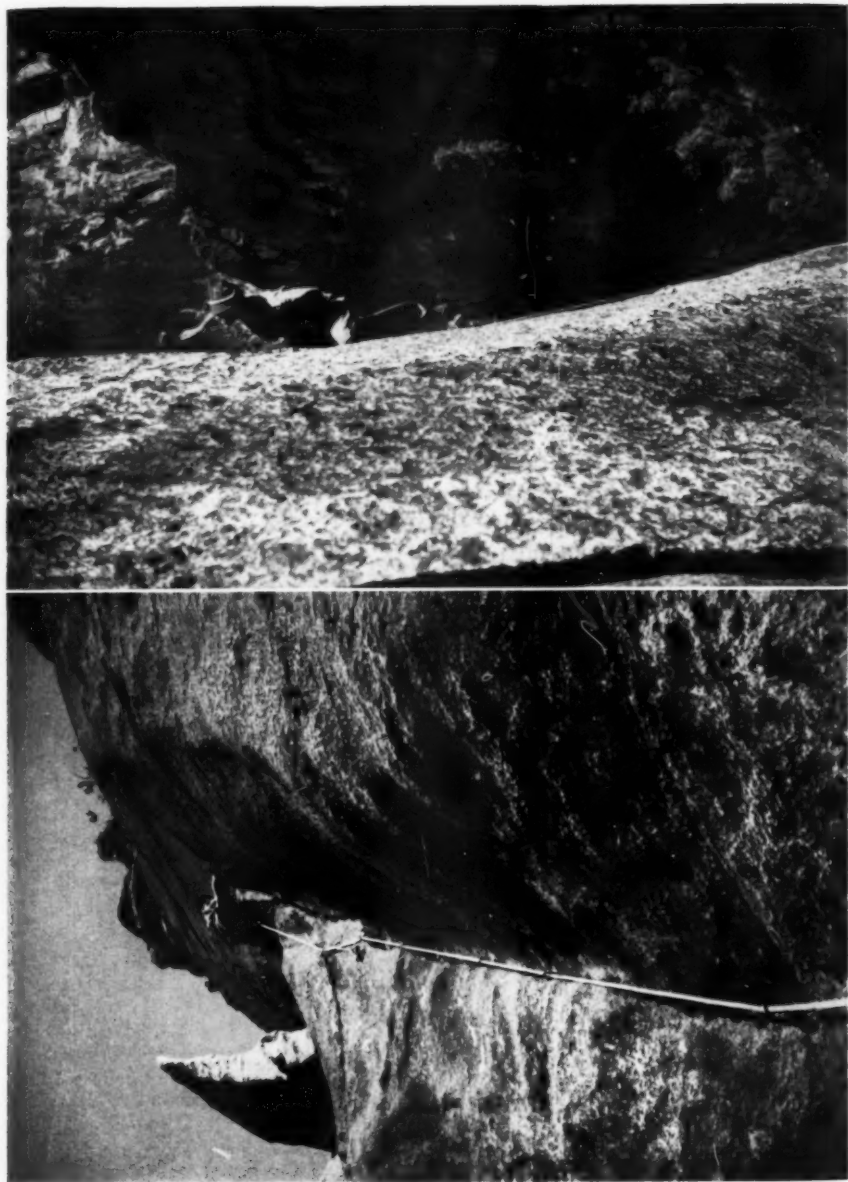
The day came finally when the dunnage and what was left of the food were packed on the burros for the last time. The little band of happy children, brown and lean from two full weeks of sunshine, and filled with all sorts of new experiences, left the last campsite and headed downtrail to the corral at Tuolumne Meadows where the automobiles had been parked and where friends with watermelons and other delicacies were

waiting. Already the trip began to take on the warm glow of retrospect. All members of the party, adults as well as children, had found a new Sierra Nevada, a gracious, gentle, inviting mountain range, full of joys and pleasures for the youngest children, which doubly heightened the appreciation of the adults.

A pack trip into the remote and wild places of the mountains is an experience which is richly rewarding and should be a part of every family's heritage. It is a builder of family solidarity. It encourages family coöperation and sharing and strengthens the family bonds of mutual understanding and respect. For a time the children can come to know their parents and the parents their children as they never can in the everyday tensions of modern life. It is well worth the effort of learning the technique of burro packing to obtain one of the most satisfying family vacations that can be had.

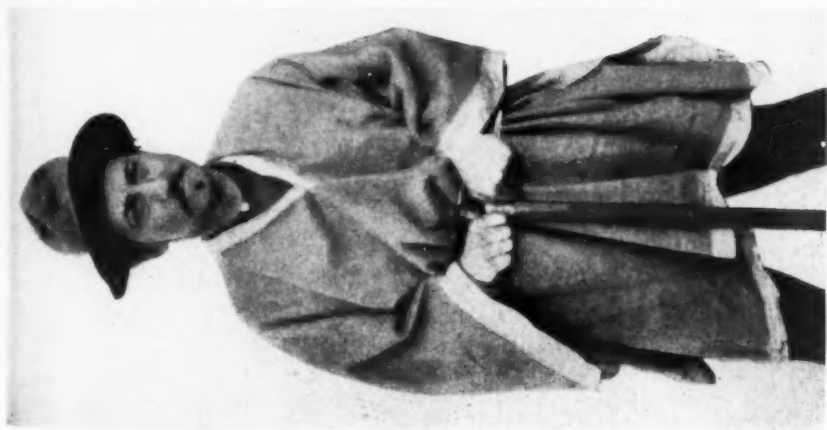


(Above) Alpine avalanche and its hurricane of powder snow. (Below) Three of the Echo Lake avalanche chutes from which similar avalanches fell. By Einar Nilsson.



On the South Face Route, Higher Cathedral Spire. In the right panel Steck is directly above the pitch shown to the left. By William Hoyt.

On the South Face Route, Higher Cathedral Spire. In the right panel Steck is directly above the pitch shown to the left. By William Hoyt.



(Left) Dr. Cook after his return from his attempted ascent of Mount McKinley. The odd costume was "simply put on for effect." By Walter Miller in *Pacific Monthly*, September, 1910. (Right) The sourdough party in 1910: McGonagall, Lloyd, Anderson, Taylor.





"The Summit" in Cook's To the Top of the Continent.



Herman Tucker on Cook's False Summit, November, 1910.

The Exploration and First Ascents of Mount McKinley

By FRANCIS P. FARQUHAR

MOUNT MCKINLEY, in the Alaska Range, is the highest mountain in North America and it is therefore of primary importance in the history of exploration that the record of its discovery, reconnaissance, and first ascents be fully and fairly established.

It may be generally supposed that this has already been done through the publications of Brooks, Browne, Stuck, and others, supplemented by the accounts of more recent climbers. Yet, as one studies the history in perspective it becomes apparent that certain controversies need reëxamination and that certain testimony not heretofore included in the record should be considered. There seems to be very little if anything to add to the accepted accounts of events before 1906, so that only a brief summary of them is necessary. The main purpose of this article is to state the facts relating to the exploration and climbs made in 1906, 1910, 1912, and 1913.*

BEFORE 1906

Captain James Cook, in 1778, and Captains Portlock and Dixon, in 1786, sailed up Cook Inlet to approximately the site of the present city of Anchorage, but although mountains are shown on their charts they cannot be identified with the high peaks of the Alaska Range. Captain George Vancouver, however, may have seen Mount McKinley in 1794, for he mentions "distant stupendous mountains covered with snow, and apparently detached from each other." In 1834, a Russian party under Malakoff ascended the Susitna River and must have seen the Alaska Range. Although there is no clear evidence of discovery on Russian maps, nevertheless there came into use a name, "Bulshaia Gora" (big mountain), which indicates some knowledge of its existence. William H. Dall seems to have given the name Alaska Range to the mountains of which Mount McKinley is chief. In 1878, Arthur Harper and Alfred Mayo saw from a tributary of the Tanana River a great ice mountain to the south. Frank Densmore, prospecting from the Tanana to the Kuskokwim, in 1889, reported the great mountain with such enthusiasm that Alaskans called it "Densmore's Mountain."

* The account of the climbs of 1912 and 1913 is to appear in the next annual.—Ed.

Pioneers in the country of Indians seem to accept quite readily the Indians' names for rivers, which, after a few struggles with spelling, become established on maps. It is not so with mountains. One reason is that mountains are usually named from a distance, with no Indians in consultation. But it is also true that the Indian rarely has any close association with a mountain—he, too, views it from a distance and seldom calls it by a specific name. Sheldon and Stuck have made strong pleas for the name "Denali," but as in the case of *Rainier v. Tacoma*, the customs of geographical nomenclature have prevailed and the white man's name, however casual its origin, has become the accepted name.

So, in 1896, came the name "Mount McKinley." William A. Dickey,¹ on a prospecting journey in the Susitna region, "recognized the surpassing height of the peak and its geographic import." (Brooks, pp. 26-27.)² Dickey wrote an account of his journey which was published in *The Sun*, New York, Sunday, January 24, 1897. "We named our great peak Mount McKinley," he says, "after William McKinley, of Ohio, who had been nominated for the Presidency, and that was the first news we received on our way out from that wonderful wilderness. We have no doubt that this peak is the highest in North America, and estimate that it is over 20,000 feet high."

Dickey's estimate has required very little correction. In 1898, Robert Muldrow, of the United States Geological Survey, obtained a figure of 20,464 by rough triangulation, and in 1902 Alfred H. Brooks and D. L. Raeburn found a mean of determinations from four stations to be 20,155 feet. The figure of 20,300 was adopted as an average. The Coast and Geodetic Survey arrived at the same figure in 1909.

Alfred Brooks, in 1902, actually set foot on Mount McKinley. "But satisfaction at standing on its slopes 9 miles from the summit, which had never before been approached by white man, could not but be tinged with regret that there was neither time nor means for reaching a higher altitude." (Brooks, p. 19.) The following year, Judge James Wickersham made the first attempt to climb the mountain, but was turned back at 10,000 feet.³

¹ William A. Dickey, 1862-1939, a native of Manchester, N.H., was a graduate of Princeton University, Class of 1885. For several years he tried prospecting in Alaska and Yukon Territory, but for most of his life he was a resident of Seattle. (*Princeton Alumni Weekly*, May 13, 1914, and May 5, 1944.)

² For citations see Bibliography at end of this article.

³ The routes are graphically shown on a series of photographs by Bradford Washburn in *American Alpine Journal*, 1947, 6:3.

Dr. Cook⁴ now enters upon the scene and the clouds of controversy appear on the horizon. There is no doubt, however, about the achievements of Cook's party in 1903. Although defeated in two attempts to climb the mountain, the party completely encircled it and made important contributions to geographic knowledge. Cook gives an account in *To the Top of the Continent*, but to get the full import of what took place one must read Robert Dunn's diary, both in *The Outing Magazine*, and in *The Shameless Diary of an Explorer*, for there are significant differences between Dunn's two versions. Whatever one may think of Dr. Cook's stubborn courage, it is impossible to believe, after reading Dunn, that Cook could have overcome the technical difficulties to be encountered in reaching the 20,000-foot summit by routes that more skillful mountaineers have declared impossible. Thus are we partly prepared for the next event.

1906

With the year 1906 three new and very important actors are introduced who will henceforth figure prominently in the drama: Herschel C. Parker, Professor of Physics at Columbia University, who had made notable first ascents in the Canadian Rockies and the Selkirks, had climbed the Matterhorn, and was well versed in the technique of climbing on ice and snow; Belmore Browne, artist, naturalist, and hunter, with previous experience in Alaska; and Henry P. Karstens, a young and powerful Alaskan, skilled in wilderness travel and in the ways of snow and ice.⁵

Parker and Browne joined Dr. Cook in an exploration of the passes to the south of Mount McKinley and the southeastern approaches to the mountain. This was accomplished by pack train and by boat on the Susitna and Yentna rivers. The party returned to Tyonek, on Cook Inlet, on August 3. Here Parker left for the States and the rest of the party broke up into several units. Dr. Cook, taking the packer Edward Barrill and another hired hand with him, returned up the Susitna "to explore the river systems and glaciers east of Mt. McKinley, and to examine the northern arête for a route to the top of the mountain for a possible future ascent." (Cook, p. 186.) It is at this point that guile, if not deliberate deception, makes its appearance. For, in a telegram, he said that he was "preparing for a last, desperate attack on Mount McKinley." (Browne, p. 69.) Cook says that he went up the Susitna and Chulitna and "as-

⁴ Frederick Albert Cook, 1865-1940. (Biographical note in *American Alpine Journal*, 1946, 6:1, 86-88.)

⁵ Herschel Clifford Parker, 1867-1944. (Biographical note in *American Alpine Journal*, 1946, 6:1, 109-111; 1947, 6:3, 408-411.) Browne is at present living in Ross, California, and Karstens in Fairbanks, Alaska.

cended the Tokosetna River to the first glacier, which on the former trip we named Ruth Glacier.⁶ . . . To the northwest, forty miles away, far above the clouds, the summit of Mount McKinley, the top of the continent, the *Ultima Thule* of our ambition, offered a tempting challenge." (*Harper's*, May, 1907, p. 825.) From this point, Cook says, he and Barrill set out on September 8. Pages 195 to 233 of his book are devoted to the next twelve days, in which he says that he and Barrill stood on the summit on the 16th and that it took "four days to tumble down to our base camp." We need not dwell upon the details of his narrative; it is largely fiction. Browne met Cook and Barrill upon their return to Cook Inlet and "knew the time that Dr. Cook had been absent was too short to allow of his even reaching the mountain." (Browne, p. 70.)

If one wishes to take Dr. Cook's side of this controversy and indulge in argument there is a good deal of material to be found. A chapter in Cook's *My Attainment of the Pole* (New York, 1911, pp. 521-534), is a fair sample. Balch (see Bibliography) also comes to the support of Cook; but then, Balch credits Lloyd with the second ascent of the South Peak and the first ascent of the North Peak—Lloyd, as will be shown, was never near the summit of either peak. On the other side of the case, we have the internal evidence of Cook's own narrative, the testimony of the Parker-Browne expedition of 1910 (Browne, Chapter 10), and the Mazama expedition of the same year (Rusk), and, finally, the positive opinions of a dozen or more later climbers who have stood on McKinley's summit in clear weather and have seen for themselves that no man could have climbed by the route that Cook claimed he took, even with many more than eight days at his disposal. The verdict will, therefore, undoubtedly stand in history that Dr. Cook did not attain the summit of Mount McKinley.

Another event in 1906 is of major importance in the history of the mountain: the hunting expedition of Charles Sheldon, in which Harry Karstens participated. "As I look back upon my experiences in Alaska and the Yukon Territory," says Sheldon, "I recall no better fortune than that which befell me when Harry Karstens was engaged as an assistant packer. Before he was twenty years of age he had left his home in Illinois bound for Alaska, and had reached Dawson during the early days of the Klondike gold rush. Later, after attempting mining on Seventy Mile Creek in Alaska, he had become a member of the small party of men who laid out the town site of Eagle. After the discovery of gold near Fairbanks he became a mail carrier, driving dogs between Fairbanks and

⁶ Named for Cook's daughter. (Rusk, III, p. 59)

Valdez and other points; and the winter before my arrival he carried mail by dog team between Fairbanks and the Kantishna mining district. He is a tall, stalwart man, well poised, frank, and strictly honorable. One of the best dog drivers in the North, and peculiarly fitted by youth and experience for explorations in little-known regions, he proved a most efficient and congenial companion."

The approach was by way of the Kantishna, Wonder Lake, and the McKinley Fork. At the foot of Peters Glacier, they found relics of Cook's camp of 1903 and of Wickersham's of 1902. Following substantially the course of their predecessors, they crossed to the foot of Muldrow Glacier and on to the head of the Toklat River. The following year Sheldon returned, established a base camp on the Toklat, and spent the winter there with Karstens. As a result of his experiences Sheldon saw the importance of establishing a great game preserve in the Alaska Range. He was equally impressed with the grandeur and beauty of the scenery, as is attested by passages in his book. "As I watched the colors change and deepen," he wrote, "a great mass of pink clouds of surpassing loveliness settled over the western crest of Denali. I shall never again view this mountain in winter, with its skies of exquisite color, but those who do in the future may perhaps realize the depth of my feelings." (Sheldon, p. 269.) Sheldon became the foremost advocate of the creation of Mount McKinley National Park, a consummation that occurred in 1917. For Karstens the experience was invaluable. Not only did he become thoroughly conversant with the surroundings of the great peak, but through his intimate association with the great naturalist he was inspired with a deep feeling for its nobler aspects. It is fitting that he should ultimately be the one to lead the first completely successful ascent of the mountain and that he should be the first superintendent of the National Park.

1910

On one of their midwinter excursions from the Toklat River base camp Sheldon and Karstens came to the cabin of Tom Lloyd and his partners Billy Taylor and Charley McGonagall,⁷ who were prospecting at the head of Moose Creek. "From the crest of the high ridge behind Lloyd's

⁷ The spelling of this name has at last been standardized. Washburn obtained it direct from McGonagall himself. (*American Alpine Journal*, 1946, 6:1, p. 172.) I have confirmed it quite independently through Harry Karstens. Finally, the United States Board on Geographic Names has made it official, as follows:

"*McGonagall Pass*: pass at an elevation of about 5,800 feet, leading from the head of Cache Creek onto Muldrow Glacier; named for Charles McGonagall, who discovered the pass; 63° 14' 00" N., 150° 43' 45" W. Not: McGonigal Pass, McGonnagall Pass, McGonogal Pass." (Decision Lists 4807, 4808, 4809, published October 1948).

cabin," writes Sheldon, "extended a magnificent unobstructed view, reaching along the Alaska Range east and west of Denali. While standing there with Tom Lloyd, I told him of the double ridge summit and of the great ice fall descending easterly from the basin between them; and asserted my belief that if no technical difficulties should be found below the upper areas, the great mountain could be climbed from the ridge bordering the north side of the glacier. This was the ridge up which it was later found possible to make the ascent. At that time no one had suspected the course of the Muldrow Glacier or had identified it with the ice fall I had observed. However, I believe that the plan later conceived by Lloyd was wholly independent of what I had casually told him, and that he had probably forgotten all about it." (Sheldon, p. 274.)

On April 12, 1910, the *Fairbanks Daily Times* carried the following headlines: "McKINLEY IS CONQUERED. Stars and Stripes Placed on Top of Continent and the Hitherto Unscaled Heights of America's Highest Peak Mastered, Is Proud Boast of Tom Lloyd, Who Returned Last Night." In view of subsequent comment, it is well to have before us the full text of this initial announcement.

That he placed the American flag on the top of the continent, higher than the Stars and Stripes were ever planted by mortal hands before, is the claim of Tom Lloyd, who returned from Mount McKinley yesterday afternoon. Tom claims that the summit of America's loftiest mountain was reached by his party, consisting of Charles McGonigle, Pete Anderson, William R. Taylor and himself, at 3:25 on April 3, and that a flag six feet by twelve feet was securely set in a rock monument on the crest of the peak, where it can be seen from the Kantishna. The flag, says Lloyd, is securely fastened with guyropes and should be able to withstand the assault of any of the storms that prevail at that height. The staff on which it is secured is four inches at the base and fourteen feet long and was hauled to the top of the mountain for the purpose.

Lloyd asserts that he has positive proof that Dr. Cook never climbed the mountain and that he will be able to demonstrate this to all. He says that he has photographs taken at the various heights and that the scenery on the upper reaches of the mountain is appalling in its grandeur. The final dash, from the camp established at the 16,000-foot level, took about two weeks, much of the time being consumed in making trail. The wind was terribly strong and amounted to almost perpetual storm.

According to Lloyd, both peaks of the mountain were climbed and the journey over to the second one, across an immense glacier, was about the toughest part of the trip. The second peak was visited because there was better chance to set the flagstaff, as on the first there was nothing but deep snow. The flag is set on the peak nearest the Kantishna.

Three camps on the mountain proper were established by the Lloyd party. One was at the edge of the willows, at the 2,900-foot level; another at the 10,000-foot level, and the third, and highest camp used, was at the 16,000-foot level. The ascent was made, to a considerable extent, over the trail traveled by Dr. Cook. While

Lloyd is reticent as to details, he claims that the party was able to determine beyond peradventure that the doctor never reached beyond a certain point.

Tom is unstinting in his praise of the men who stayed with him on the trip, and he says that he could ask to have no better men with him than McGonigle, Anderson and Taylor. He is becomingly modest in regard to his share in the conquering of the 20,464-foot mountain that, so far as is known, was never climbed by human being before.

In addition to the photographs brought back by Lloyd, he has some samples of the rock found near the summit, which he intends to submit to Alfred H. Brooks and to the Smithsonian Institute.

The story was both sensational and timely and it made the front page of the New York papers the next day and for several days following. Further details were called for, and W. F. Thompson, editor of the Fairbanks *News-Miner* was engaged to send a full account, which appeared with photographic illustrations as a three-page spread in *The New York Times*, June 5.

Meanwhile, skeptical warnings and even statements of outright disbelief began to appear. Most discriminating of these was Charles Sheldon's in *The New York Times*, April 16. He advised the public to await a fuller report. "Only Tom Lloyd, apparently," he noted, "brought out the report, the other members of the party having remained in the Kantishna district, so we haven't their corroborative evidence." Sheldon's perception was acute and to the point. He knew McGonagall and Taylor to be "very hardy young men, among the best dog 'mushers' in the country, and thoroughly familiar with winter travel," as well as "courageous and capable of enduring the cold and physical work." But he also knew that they had no experience with technical mountaineering equipment, and, above all, he knew Tom Lloyd. The latter was much older than his associates and had certain shortcomings which were well known. There were others who expressed doubts. Professor Parker, who was about to make another attempt on his own part, stated that "he wanted to be shown before he believed the story, just as he was open to conviction that Dr. Cook had reached the north pole." (Fairbanks *Daily Times*, May 7, 1910.)

It is unfortunate that Lloyd's boasting and the hasty acceptance of his exuberant report by his backers in Fairbanks and by the newspapers should have had the result of discrediting the truly remarkable achievement of the men who actually made the climb. Taylor and McGonagall, mining partners with Lloyd, were reluctant to talk. They had agreed to let Tom do all the talking and they stayed with it. Anderson was an employee of the partners, and in any case was not much concerned about

what he appeared to consider as something all in the day's work. It soon developed, however, that Tom Lloyd had not been on the summit of either the North or the South peak; he had not, in fact, been on the upper part of the mountain at all. It also was made clear that the others had not climbed the South Peak; they had not even attempted it. Their sole concern was to plant a flagpole on the North Peak where the flag might be seen by telescope from Fairbanks. In Fairbanks it was generally believed that this had been accomplished. What, then, are the facts, and to what extent have they been verified?

The accounts published in the Fairbanks and New York papers immediately following the event are, in themselves, sufficiently circumstantial to prove the main outlines of the story. This is true even of the account printed in *The New York Times*, June 5. After a liberal allowance for Lloyd's obvious efforts to keep himself in the picture, portions of the narrative are reasonably consistent. Take such entries as the following:

March 23.—Charley and Pete are trying out the final upraise to the summits, cutting steps and staking the way [with willow sticks].

March 25.—Opposite our camp a great slide came tearing down the rise, and I tell you she was a pretty sight. She came half way across the glacier, and it looked as if it was coming all the way, but it filled up the crevasses as it came and stopped when it had covered about half the distance across the glacier.

March 27.—While the boys above us are cutting the final steps to the summits today, Taylor and I go back to Willow Camp for wood. It is a fine day. In talking of McKinley we call it 'Mac.'

March 30.—It blew a gale across the glacier last night, and was very foggy this morning, but it cleared up about 10 a.m. Taylor started out for the summit, and I started back to Willow Camp.

March 31.—Hauling wood to the Willow Camp from down in the Flat. Forenoon fine.

There at the Willow Camp, we must leave Tom Lloyd. He says he went back up and joined the boys, first on a climb of "the coast summit," on April 2, then, on April 3, to the northern summit, but the circumstantial details prevalent up to this point are lacking and it is quite evident that Tom is climbing in a wishful dream.

At the close of his story Tom nobly, and rather pathetically, gives credit to the boys:

I wish to here publicly acknowledge that they were far superior to me in ability at any stage of this climb, up or down or on the level. They did the work, before and behind, and I kept camp.—The boys staked the trail and moved the camps, and I moved on with the camps. They made it as easy for me as they possibly could and so I was able to get through. But for their help I never could have done half of

even what I did do. The trouble with me, principally, was that I was mostly too fat for climbing mountains, but I lost thirty pounds on the trip.

And, again:

Bill Taylor is a big man and strong as a horse—I cannot express myself satisfactorily regarding that Swede, Pete Anderson. He is a tower of strength, his endurance seems limitless.—Everyone in Tanana knows Charley McGonagell. He has been a mail driver in the North for years, and he is a wonderful fellow.—Taylor and me have been partners for years and—I have never had words with him. He is, beyond question, one of the finest men you ever met.—Charley has been with us for five years, and since Pete came in over the Pass years ago he has been with me. And I have known them to be good men. I banked on them, more than on myself, and they made good.

Leaving Lloyd, therefore, as definitely out of it insofar as a summit climb is concerned, we find three men cutting steps up to higher altitudes and placing willows as guides for their final attack and for the descent. They had crampons and ice-axes which they had fashioned themselves. They were exceptionally capable men, inured to all the hardships of snow and ice and winter weather. Moreover, they had a job to do—to place that flagpole on the summit where it could be seen. They were not the kind to quit before their purpose was accomplished. That it was accomplished is the verdict that is likely to prevail in history. What is the proof?

Complete and convincing proof is an entry in a little pocket diary carried by Harry Karstens on his climb in 1913. Karstens kept a concise record of the climb in pencil entries made at the time. This diary is before me as I write. The entry for June 3 reads as follows:

Windy and cold. Moved camp very near to top of 1st serack making 2 trips. Very near 17,000 ft. basin where Parker climbed from though something must have been wrong to climb from there. "Hurrah" every one sees flag staf on North Peak. Perfectly clear through glasses.

Hudson Stuck's statement in his book (p. 173) is thus corroborated, if, indeed, any corroboration should be deemed necessary. Stuck says that Walter Harper, the native Alaskan, first caught sight of it. Stuck "was never sure that he saw it with the naked eye, though Karstens and Tatum⁸ did so as soon as Walter pointed it out, but through the field-glasses it was plain and prominent and unmistakable." Emphasis is

⁸ The Rev. Robert G. Tatum is quoted in *The Knoxville News-Sentinel*, May 22, 1932: "They were able to see the flagpole on top of the north peak of Denali that a previous expedition had planted."

given here to this evidence because the Parker-Browne party of the preceding year had failed to see the pole. Belmore Browne writes as follows:

From the time that we had topped the ridge the great northern summit of Mount McKinley had claimed our attention. It rose directly opposite to us and every detail of its ice and rock stood out in bold relief against the northern sky. Report has it that the Lloyd Mount McKinley party had reached this peak or one of its northern shoulders and there raised a pole above a pile of rocks.

On our journey up the McKinley Glacier far below we had begun to study this peak. As we advanced closer and closer each pinnacle of the Northern Ridge stood out in turn against the sky until on the last days close to the southern summit every rock and snow slope of that approach had come into the field of our powerful binoculars. We not only saw no sign of a flag-pole but it is our concerted opinion that the Northern Peak is more inaccessible than its higher southern sister. (Browne, pp. 340-341.)

It was this conviction of Parker and Browne that there was no flag pole on the North Peak that for a time threw the weight of opinion on the side of those who did not believe Tom Lloyd's tall tales. There are various explanations for the failure of the 1912 party to see the pole; but, after all, failure to see something is not conclusive proof that it isn't there, and the positive testimony of Karstens and Stuck that they saw it a year later must prevail.

But even without this testimony the statements of the men themselves, leaving Lloyd out of the picture, should be sufficient. They have been interviewed from time to time at long intervals and their stories have always been consistent. Hudson Stuck says (p. 170) that he talked "with every member of the actual climbing party with a view to sifting the matter thoroughly." It was his unqualified conclusion that "to Pete Anderson and Billy Taylor, two of the strongest men, physically, in all the North, and to none other, belongs the honor of the first ascent of the North Peak." (p. 174.) Sheldon, cautious at first, finally summed up unequivocally, as follows:

Lloyd organized the party, including McGonigle, Taylor, and Pete Anderson, which made the ascent of the north peak of Denali: McGonigle turned back just before reaching the summit of the north crest, but Taylor and Anderson kept on and planted a flagstaff on it. This feat, successfully achieved by these hardy Alaskans, untrained and inexperienced in technical Alpine work, was one of the most remarkable mountain climbs ever achieved. The summits they had always had in view were those of the north ridge of Denali, which they believed to be the highest, and they wanted to fly the flag from a point where it might be seen from the north side. Had they so wished, with a little more effort they could have reached the highest point of the mountain, which is on the other ridge. (Pp. 273-274.)

In more recent years, with a fuller knowledge of the mountain and with a better comprehension of man's capabilities upon it, further interviews with at least two of the participants have strengthened the case. Norman Bright met Billy Taylor at McKinley Park Station in 1937 and published the interview in the *American Alpine Journal*. Taylor's opinion of Anderson is worth noting: "Him and I'd go along and never have no trouble at all. He was a husky 'sunofagun.'" Lloyd was "fine in his way, but he was lookin' for too much fame. He conflicted his stories by telling his intimate friends he didn't climb it and told others he was at the top. We didn't get out till June and, then, they didn't believe any of us had climbed it." Taylor speaks of the flagpole: "A 14-ft. pole 4 inches at the top⁹ end—dry spruce. We packed it and pulled it up. Where we couldn't pack it, we pulled it up on a line." (Bright, p. 283.)

In September 1948 I spent an evening with Charley McGonagall at his home in Fairbanks, accompanied by Harry Karstens. Harry and I had talked a good deal about the history of the mountain and were well primed with questions. Harry said he had never known Charley to speak so freely about the climb, even to him, his former partner. I came away with no doubts whatever about what took place on the mountain that spring of 1910. "Billy and Pete were skookum, and I was pretty good myself in those days. Lloyd was too old and too fat—he never got above 11,000 feet. The only reason we climbed the mountain was to prove Doc Cook hadn't done it and we could. By just looking at the mountain we knew he was a liar. We proved we climbed it by setting up the pole. We wouldn't have gone to the other peak even if we'd known it was higher, because you couldn't have seen the pole if we'd put it on the South Peak. We put it on the North Peak because we thought it could be seen from Fairbanks. No, I didn't go clear to the top—why should I? I'd finished my turn carrying the pole before we got there. Taylor and Pete finished the job—I sat down and rested, then went back to camp. Sure I could have gone up, but what for? The others had the pole and didn't need any help." Bright says McGonagall told him he went to the top, and he may have said so, but with the meaning that he went up to the summit region as distinguished from the lower glacier. In my conversation with him he made it very clear that he did not go to the highest point of the North Peak. On the contrary, he insisted that he had no reason for doing so. One thing that McGonagall said explains a detail in Bright's interview with Taylor. The latter says that their principal

⁹ Other testimony clearly indicates that it was 4 inches at the base.

ration on the summit climb was caribou meat and doughnuts. Charley said he made the doughnuts himself at a lower altitude. "They don't freeze so easy as biscuit." Harry Karstens says Charley was always a good cook. Incidentally, doughnuts and meat made a very good balanced diet for such a climb.

One thing that McGonagall brought out during my visit was entirely new to me and explained an incident that Karstens had mentioned a long time before. Harry had told me that Anderson had made a second climb nearly to the summit after the party had come a long way down. We asked Charley about this. "No," he said, "that wasn't it at all. It was this way. After we had come down to our base camp and Lloyd had gone out he sent word that most of the pictures we had taken were no good. So, Pete and Billy and I went back up and took some more pictures at the place between the two peaks where you can look over to Foraker." "Where did you camp?" I asked. "We didn't camp—we just kept going for three days—it was light enough, and we were all skookum."

The following day I found in the *Fairbanks Daily Times* of June 9, 1910, corroboration of this second climb, an event that seems to have hitherto escaped notice. "Lloyd had asked the boys to get as near the summit as necessary to get some good pictures," says the *Times*, "and as they figured they could not get any nearer to the summit than the top, they just kept on climbing until there was no more mountain left to climb." It wasn't exactly like that, according to McGonagall, but the fact remains that all three did make a second climb and reached Denali Pass, 18,000 feet.

Although Charley McGonagall did not himself actually reach the summit of the North Peak, he played a very important part in the climb. It was he who discovered the pass across the great western ridge, which has ever since been used as the approach to Muldrow Glacier and has proved to be the key to the mountain. It is rightfully known as McGonagall Pass.

While all this was going on two other parties were entering the field bent on disproving Dr. Cook's claim and on making a try at the ascent themselves.

Herschel C. Parker and Belmore Browne set out in May 1910 for another attempt to reach Mount McKinley from the south by the river route up the Susitna and the Chulitna. Their principal objectives were to map the southern and eastern glaciers and ridges, to climb the mountain if they could, but above all to demonstrate that Dr. Cook had not climbed it. If they could show, as from their knowledge of the country they believed they could, that Dr. Cook's published photographs were

not what they purported to be, it would not only prove Cook's claimed ascent of the mountain to be false, but it would greatly discredit his assertion that he had reached the North Pole.

In the first and last of these objectives the expedition was successful; but the mountain remained impregnable by all avenues of approach from the south. Repeated attempts on routes up the glaciers by Parker and Browne, with such strong allies as John H. Cuntz,¹⁰ Valdemar Grassi, Herman L. Tucker, and Merl La Voy, ended in failure on huge ice walls.

We turned back at 10,300 feet. McKinley had beaten us again, but, figuratively speaking, we patted the big mountain on the back, and turned to get what comfort we could from the splendours about us. (Parker and Browne, in *Canadian Alpine Journal*, 1911, Vol. 3, p. 70.)

In the face of such walls Cook's claims were, to them at least, preposterous. But there was even better proof that Cook had not succeeded. In spite of the limited time at his disposal he had made a detour away from the mountain. It was on this detour that he took the pictures published in his book and articles. Parker and La Voy duplicated his shots, including the alleged view of "The Top of Our Continent," which turned out to be a "little outcrop of rock," hardly more than 5,000 feet above sea level.

The competition for the first ascent of Mount McKinley brought still another expedition to the mountain that summer. A party led by Claude E. Rusk¹¹ of the Mazamas, of Oregon, and including A. L. Cool, mountaineer and guide, F. H. Rojec, photographer, and Joseph Ridley, forest ranger, paralleled closely the route of the Parker-Browne party to the southern glaciers. They were not prepared for a long siege, however, and were compelled to retire without making an attempt to climb the mountain. They did, nevertheless, quite independently of Parker and Browne, demonstrate the utter falsity of Dr. Cook's account. As Rusk's narrative has not been widely circulated, it may be well to quote from it here:

As we gazed upon the forbidding crags of the great mountain, and realized that it would require perhaps weeks or months in which to explore a route to the summit, we realized how utterly impossible and absurd was the story of this man, who, carrying a pack, claims to have started from the mouth of the Tokisitna on the eighth of September, and to have stood on the highest point of McKinley on the sixteenth of the same month. The man does not live who can perform that feat! (Rusk, II, p 483.)

¹⁰ John Henry Cuntz, 1866-1928. (Biographical note in *American Alpine Journal*, 1929, 1:1, p. 86.)

¹¹ Claude Ewing Rusk, 1871-1931. (Biographical note in *American Alpine Journal*, 1946, 6:1, pp. 117-119.)

Farther on he wrote:

And what of Dr. Cook? During my sojourn in Alaska, I talked with many men concerning him. All—with a single exception—were united in the belief that he did not reach the top of Mt. McKinley. Of his courage and resolution there can be no doubt. He is described as absolutely fearless. He was also considered as always willing to do his share and as an all-round good fellow to be out with. Had he been content to rest his laurels upon the things he had actually accomplished—to say nothing of the possibilities of the future—his fame would have been secure. His explorations around Mt. McKinley were extensive. They were of interest and of value to the world. He discovered a practicable route to the great mountain from the southeast side. Had he persevered, he doubtless would have reached the summit on some future expedition. He was the first to demonstrate the possibility of launch navigation up the Susitna and the Chulitna. That one trip alone—when with a single companion he braved the awful solitude of Ruth Glacier and penetrated the wild, crag-guarded region near the foot of McKinley—should have made him famous. But the Devil took him up onto an exceeding high mount and showed him the glories of the icy alpine world and—the doctor fell. Let us draw the mantle of charity around him and believe, if we can, that there is a thread of insanity running through the woof of his brilliant mind. (Rusk, III, p. 58.)

The Mazama party gave names to a number of the peaks above Ruth Glacier, notably: Mount Mazama (which Rusk was convinced was the peak Cook actually climbed and was also identified as such by the Parker-Browne party), Mount Lee (in honor of John A. Lee, then president of the Mazamas), Mount Sholes (for Charles H. Sholes, a former president), and Mount Glisan (for Rodney L. Glisan, also a Mazama president).

From time to time members of the two parties met each other and Rusk remarks, "Our relations with the Parker-Browne party had been of the most friendly character, and the best of feeling prevailed between us."

As they retired from the scene, baffled at every point in their attempts to climb the peak by a southern route, neither the Mazama party nor the Parker-Browne party had any means of knowing that over on the other side of the mountain three very "skookum" men of Alaska were back working at their accustomed tasks after a little excursion in the course of which they had discovered the most practicable route to the summit of Mount McKinley.

BIBLIOGRAPHY

- Only the principal sources relating to the period covered by this article, namely, through the year 1913, are included here. For additional titles see "A List of Publications relating to the Mountains of Alaska," by Francis P. Farquhar and Mildred P. Ashley, published by the American Alpine Club, New York, 1934. For subsequent ascents see *Sierra Club Bulletin*, 1933, 18:1, pp. 81-87; 1943, 28:3, pp. 1-35; *American Alpine Journal*, 1933, 2:1, pp. 36-68; 1943, 5:1, pp. 1-13; 1947, 6:3, pp. 283-293; 1948, 7:1, pp. 40-58.
- BALCH, EDWIN SWIFT. *Mount McKinley and Mountain Climbers' Proofs*. Philadelphia, 1914.
- BRIGHT, NORMAN. "Billy Taylor, Sourdough." *American Alpine Journal*, 1939, 3:3, pp. 274-286.
- BROOKS, ALFRED H. The Mount McKinley Region, Alaska. U.S.G.S. Professional Paper 70. Washington, 1911.
- BROWNE, BELMORE. *The Conquest of Mount McKinley*. New York and London, 1913.
- . Five articles in *The Outing Magazine*. February to May, and July, 1913.
- . "The Conquering of Mt. McKinley." *Hearst's Magazine*, December, 1912.
- COOK, FREDERICK A. *To the Top of the Continent*. New York, 1908; London, 1909.
- . "America's Unconquered Mountain." *Harper's Monthly Magazine*, January and February, 1904.
- . "The Conquest of Mount McKinley." *Harper's Monthly Magazine*, May, 1907.
- DUNN, ROBERT. *The Shameless Diary of an Explorer*. New York, 1907.
- . Five articles in *The Outing Magazine*, January to May, 1904.
- METCALFE, GERTRUDE. "Mount McKinley and the Mazama Expedition." *The Pacific Monthly* (Portland), September, 1910.
- RUSK, CLAUDE E. "On the Trail of Dr. Cook." *The Pacific Monthly*: Part I, October, 1910; Part II, November, 1910; Part III, January, 1911.
- SHELDON, CHARLES. *The Wilderness of Denali*. New York and London, 1930.
- STUCK, HUDSON. *The Ascent of Denali (Mount McKinley)*. New York and London, 1914.
- . "The Ascent of Denali (Mount McKinley)." *Scribner's Magazine*, November, 1913.

Matthes Crest

By REID V. MORAN

THE LATE Dr. François E. Matthes gave the name "Cockscomb Crest" to the prominent peaks south of Unicorn Peak in the Cathedral Range of Yosemite National Park.¹ It is an admirably descriptive name.

Cockscomb Crest is by no means unique in the Cathedral Range. Columbia Finger and Unicorn Peak, as well as several unnamed ridges, are of the same remarkable type. Somewhat similar is Cathedral Peak, which is massive below but culminates in several delicate spires, and Echo Peaks, which form a cluster of irregular pyramids above a smooth upsweep. John Muir and J. Smeaton Chase had both suggested that these crests were never overtopped by glacial ice but were sculptured by the ice which flowed around them and planed off their lower slopes. Dr. Matthes, who spent two seasons tracing the ice line of the former Yosemite and Tenaya Glaciers, was able to confirm this theory.

When Dr. Matthes proposed the name "Cockscomb Crest" for one specific peak, he also suggested that "cockscomb" was a suitable generic term for all such peaks "which owe their attenuated linear forms to the paring action of the ice that split upon them and passed on either side without overwhelming them." Cockscmob Crest and Columbia Finger he regarded as examples of the pure type of the genus, whereas the forms of some of the others were influenced by other factors, such as local peculiarities in rock structure or headward erosion by local cirque glaciers.

Perhaps the most spectacular cockscomb in the Cathedral Range is a knifelike ridge south of Echo Peaks, which has remained virtually unknown. It has never been officially named, though it has sometimes been called by the group name "Echo Ridge." This ridge is clearly visible from many vantage points such as Eagle Peak and Kuna Crest. Its western side may be seen at fairly close range from the Sunrise and Soda Springs Trail. (For a photograph of this side, see the cover of *Yosemite Nature Notes* for July, 1948.) Its most inspiring aspect, however, is seen from the southeast, where there are no trails, which accounts for its lack of renown.

This spectacular cockscomb ridge is in need of a distinctive name. The name of Dr. François E. Matthes is closely connected with the deciphering of the geological story of the Yosemite region in general and of the cockscomb ridges in particular. He was a great lover of the High Sierra; and

¹ "Cockscomb Crest," *SCB*, 11 (1920):21-28, pls. xi-xv.

he was the rare man of science who, through the clarity and simplicity of his prose, made his great knowledge of the geological story available not merely to his professional colleagues but also to the mountain-loving layman. Therefore it seems appropriate that this ridge be known as "Matthes Crest" and the lake at its eastern base as "Matthes Lake."

Dr. Matthes was a very modest and unassuming man and would have been the last to suggest that anything be named in his honor. However, he was greatly pleased at the suggestion that this ridge bear his name, saying he knew no other unnamed feature in the Sierra which he would rather have chosen.

Matthes Crest is in sections 19 and 30, township 1 south, range 24 east, Mt. Diablo Base and Meridian. It extends about a mile and a half to the south-southeast from the unnamed peak between Echo Peaks and Cockscomb Crest. Matthes Lake lies in sections 30 and 31, at the southern end of a U-shaped valley parallel with Matthes Crest and to the east. It is drained by a tributary of Cathedral Fork of Echo Creek.

Matthes Crest is atypical of cockscombs in that the crest is large and is on a comparatively narrow ridge rather than a rounded peak. The crest consists of three parts. The northern section, about half a mile in length, stands more than 1200 feet above Matthes Lake. Its southern end, visible from the lake, shows a curiously arched jointing of the granite. The middle section is an obelisk set back to the west and thus hidden from the lake. The southern section is a short ridge, notched in the middle.

The difficult ascent of the highest point on the northern section was made by a party of seven on July 9, 1934.² This ascent was from the east. The southern section is easily climbed from the west by way of the talus extending nearly to the notch. The northern section looks as if it also might be climbed easily from the west.

Dr. Matthes concluded his article on Cockscomb Crest with the plea that serious thought be given to the selection of appropriate names for any of the features of Yosemite National Park that were yet unnamed. For this outstanding cockscomb ridge, it appears that no more appropriate name could be chosen than the name of the outstanding glacial geologist, Dr. François E. Matthes.

² Mountain Climbing on the 1934 Outing. Notes by Glen Dawson. *Sierra Club Bulletin*. 20:103-104. 1935.

Winter Sports in Mineral King

By LEWIS F. CLARK

[There is presented here a progress report on behalf of the Winter Sports Committee regarding studies by certain Sierra Club skiers of the potentialities of the Mineral King area as a ski-resort center. The views set forth are those of the individuals cited and do not necessarily reflect the conclusions of the Winter Sports Committee.]

No attempt has been made in this report to consider the impact on summer use of the area which would inevitably result should proposed developments and road improvements be accomplished in part or in full.

A draft of the report was submitted to the members of the inspection party (except Mr. Wegele). They all concurred with the general views expressed. Several of them added their comments, which have been incorporated in this report.]

OVER THE week end of May 15-16, 1948, a party of twelve experienced skiers, eleven being members and two being directors of the Sierra Club, visited Mineral King and the headwaters of the East Fork of the Kaweah River. On Saturday we skied to Farewell Gap (10,588 ft.) and on Sunday skied to the south end of Miner's Ridge (about 10,000 ft.), which walls Mineral King village on the west. The appended list of personnel of the inspection party shows that its members represent many years of skiing background in various parts of the United States, Canada, and Europe. Two members of the party had also skied in the Mineral King region (Franklin and Monarch lakes) for several days around May 30, 1941. Of course, viewing this area for a few days in May does not qualify one to pass final judgment on it as a ski-resort center. Nevertheless, it is of interest to have the reactions of the club skiers to mid-spring conditions of terrain and snow cover.

For the record it should be mentioned that 1948 was an extraordinary year with regard to snow storms. Almost no snow fell in January, normally one of the stormiest of months, yet a succession of storms in February and March, persisting with unusual coldness and strength into April, brought the seasonal snowfall nearly to normal.

During the winter of 1947-48 a survey of snow, water, and weather and terrain conditions was conducted under the joint auspices of the Forest Service, the Tulare County Board of Supervisors, and the Mineral

King Committee of the California Ski Association. Three experienced skiers stayed at Mineral King guard station from November 1, 1947 to April 30, 1948, taking observations and making many ski tours throughout the area. A report on this survey, consisting chiefly of a compilation of the data collected, without attempt to analyze the material, has been prepared by the chief of the survey party and Mr. James Gibson of the regional office of the Forest Service. The Forest Service report was not available to the club inspection party at the time the report herewith presented was reviewed.

Need for extended study.—We recognize the great value of on-the-spot information such as was gathered this past winter by the survey party. This is only the beginning, however. We believe that viewing the area during a single season cannot provide all the evidence necessary to come to sound conclusions on all phases of a potential winter sports development. Data on snow and avalanche conditions over a period of years, including both light seasons, such as we had in early 1948, and heavy seasons, are needed to come to final conclusions. Periodic photographs by air during an average winter might be of considerable help in determining the avalanche hazard and in localizing dangerous areas. This could probably be done cheaply from a private plane.

The area.—The East Fork of the Kaweah River begins its course in a practically level valley which runs approximately south to north and contains at its lower end, at 7,800 feet elevation, the village and post office of Mineral King. The main U-shaped canyon exhibits the cliffs surmounted by hanging valleys and snow-filled cirques typical of a glaciated region. Most of the hanging valleys send their streams over cascades into the main valley. At times of light snow, for example in the early months of a light season such as 1948, access to the higher snow basins requires crossing rocky benches and cliffs. These would be at least a hurdle and would appear to involve considerable hazard to skiers less than expert in descending from the high basins, especially if the skiers had gone up by lift.

Carefully designed intermediate trails could be cut, marked and controlled (by signs and notices) to protect the advanced novices (3d class) or perhaps even a strong 4th class skier.

The whole area is scenically spectacular and fine views of peaks beyond the bounding crest of the Mineral King watershed are revealed from many high peaks and ridges, particularly from Miner's Ridge, which lies immediately west of the main valley, separating it from the Mosquito Lake basin.

We understand that the slopes around Mineral King are unusually free from wind owing to the protection afforded by the surrounding high peaks. This would, of course, tend to preserve powder snow conditions on east- and west-facing slopes, which in more exposed parts of the Sierra would become wind-slabbed or crusted more often. The consensus of our group was that for reliable snow slopes, which are requisite to a first-class ski resort, north- and northeast-facing slopes are necessary to preserve the powdery quality of snow from the strong sun at this latitude. *This cannot be emphasized too strongly.*

There are slopes which meet this qualification, fairly accessible from Mineral King village, although some of the fine-looking slopes would probably not qualify. Such questions should be settled surely before starting a large development.

Cirque basins.—We understand that the White Chief Basin was considered by the 1948 survey party to be one of the best in the region. Although we did not visit this basin we did cross its outlet, which consists of a narrow valley with cliffs and benches. Some hazard seems to lie here for skiers descending the outlet, although negotiable routes can be found. The bowl surrounding Eagle Lake, and its valley dropping away to the northeast, appeared, from our viewpoint on Miner's Ridge, to be worthy of consideration. The upper part of the valley outlet is not too narrow and contains few trees. The Franklin bowl, east and south of the main valley, appealed to several of us who skied up to Franklin Pass in 1941. There are good north-facing slopes in this basin above 10,000 feet, although they are not easily accessible. If any of these cirque basins were to be used as regular skiing areas, carefully planned and signed routes should be established to lead skiers down the lower slopes.

Miner's Ridge.—Perhaps the slopes best suited to a ski-lift development, which would afford north-facing descents steep enough to challenge expert skiers, yet with gentler routes also, and free from the steeper cliffs, lie on the north end of Miner's Ridge, which separates Mineral King valley from the Mosquito Lakes drainage. A vertical descent of 1,500 feet over the north end would provide excellent general and slalom skiing, and intermediate downhill racing. It would not be long enough for first-class downhill races, however. The crest of the ridge, especially toward the southern end, affords magnificent panoramas of alpine scenery. In stormy weather, this ridge, like most of the hanging basins, would be hazardous because of the sharp and sometimes sheer drop-offs, over which wandering skiers might accidentally plunge in fog or blizzard. Such problems would have to be anticipated by posting areas and using controls.

We believe that after a few years' observations this ridge would be found to have some excellent trail possibilities.

Superb ski-touring terrain.—All agreed that this region affords some of the finest ski-touring terrain in the country. Dr. Bradley was most enthusiastic about this feature, which, of course, appeals especially to the Sierra Club. Mountains rising to 11,000 and 12,400 feet lie in a horseshoe cluster around Mineral King, and most of these should be attainable under good conditions in a day's trip from base camp. The terrain is ideal for the tourer who seeks a maximum of climbing with long downhill runs and who yet prefers to live in the relative comfort of a cabin rather than a snow camp. It would also appeal to the ski mountaineer who pitches his shelter tent in a high cirque. This kind of skiing presupposes sufficient knowledge of terrain and snowcraft to permit one to recognize avalanche hazards and to find a route without relying on patrolled trails.

Ski touring is of minor appeal to most patrons of a resort which caters primarily to downhill-only skiing. Probably close to 95 per cent of all skiers these days are interested chiefly in downhill skiing.

Spring snow conditions.—Another question is whether spring skiing would be good as a general rule. Our finding of soggy snow which did not freeze overnight might be a frequent or an exceptional condition.

Effect of altitude.—As has been intimated, most of the good skiing basins and ridges are in the elevation range of from 9,000 to 11,000 feet. This is rather high for many persons who are not conditioned to exercise at these altitudes. The physiological effects should be considered if it were planned to use these sections as integral part of an area development.

Avalanche hazards.—The avalanche hazard appears to be a real one in the Mineral King valley and in the higher cirque basins, although this seems to have been played down in the press reports extolling the virtues of the area as a marvelous ski resort. We understand that students of this area have claimed that the avalanche hazard, whatever it may be, can be effectively controlled by artificial avalanche dikes, snow fences, and by shooting down snow masses that may avalanche. These measures are claimed to be successful in Europe. It seems to be agreed, however, that if they are to be effective they would be rather expensive.

A careful survey, including assistance of geologists and mountain experts, should be made to determine the feasibility of planning facilities and trails so as to avoid the avalanche hazard to a major degree and so as to rely on dikes, fences, and shooting as purely secondary measures.

The summer visitor can see in a few glances the many evidences of avalanche tracks on both sides of the Mineral King valley from one side

to the other. The testimony of persons who have lived in this valley for many years confirms the fact that over a period of years many avalanches can be expected. Daniel Tobin, former ranger in Sequoia National Park and now Superintendent of Lassen Park, told me that he understood that the original mining development which gave this region its name was abandoned because all the housing for several hundred persons was wiped out by avalanches before mining operations could be successfully established. Ray Buckman says that all of the cabins on his plot except the store have been damaged or moved by avalanches at one time or another. The avalanche hazard involves not only peril to buildings and their occupants, but also to skiers on the slopes.

The avalanche hazard should be considered not only from the standpoint of the more expert skiers, but also with respect to the beginners and "bunnies" who to a considerable extent pay the bills. Such skiers are less able to recognize danger and to keep out of its way.

Steep slopes for beginners.—The precipitousness of the valley walls, which rise from 1,000 to 1,500 feet above the valley floor at angles up to 25° and 35°, contributes to their spectacular appearance; it is also responsible for their avalanche possibilities, and constitutes rather a disadvantage to beginners who generally are unqualified to cope with such slopes. Most of the gentler slopes previously referred to are above these valley walls.

Highway improvement.—An important factor in the economic development of a Mineral King ski resort which is recognized by all who are familiar with this region is the necessity for a first-class safe highway. The present road with its sharp turns, steep pitches, and narrow stretches, could not be kept open under severe storm conditions; and even if open, would be a dangerous road for any appreciable volume of winter traffic.

The cost of constructing an acceptable mountain highway in a new alignment in this steep rocky country might run, it has been roughly estimated by several persons acquainted with road building costs, from two to four million dollars. We do not know of any estimates of the road-clearing costs, but since it would be a stub road maintained primarily for the skiers, the snow removal costs might have to be borne by the patrons of the resort (indirectly, perhaps). The possibility of public subsidy must be considered, however, with the likelihood that it would probably be roughly proportional to the extent of provision for mass-skiing facilities.

Comparisons.—Some of the enthusiastic descriptions of Mineral King—"six Sun Valleys rolled into one"—and similar glowing statements, seem exaggerated to us. Yet we must admit that the area has an extraor-

inary selection of peaks, passes, lakes, and cirques. The scenery is undoubtedly more spectacular and more intimate than that of Sun Valley, perhaps more than that of Alta, Utah. The space available for resort buildings and appurtenances is less than at Sun Valley, more than at Alta. The access problem is vastly more difficult at Mineral King than at either of the other resorts mentioned. The ski touring at Mineral King appears to have greater possibilities than in any other comparable area known to our party in this country.

Tentative conclusions.—The tentative conclusions reached by our inspection group can be summarized as follows:

- 1) The terrain and snow conditions appear excellent for ski touring.
- 2) The suitability of the Mineral King valley as a ski resort center is questionable from a practical point of view, and no such development should be undertaken without considerable further study, including more on-the-snow observations, and seasonal inspection by geologists and snow experts. This is because of the expense of a winter road, the problem of moving people from suitable lodge sites to suitable ski slopes, the hazards of avalanche and terrain, and the problem of supply.

SKIING BACKGROUND OF PERSONS CONTRIBUTING TO REPORT

DAVID J. BRADLEY, Dartmouth ski team and ski racing in New England, Sun Valley, Eastern Canada, Italy, Switzerland, Norway. Ski touring in Europe, Eastern United States, Donner Summit, Tuolumne Meadows. Contributor to numerous ski articles in American Ski Annual. Author of *No Place to Hide*.

RICHARD N. BURNLEY, former chairman of the Clair Tappaan Lodge Committee and member of Winter Sports Committee for over 6 years. Recreational skiing at Sun Valley, Mount Hood, Donner Summit, Yosemite, Mineral King (1941 and 1948), Mount Shasta, Mount Lassen.

LEWIS F. CLARK, chairman, Clair Tappaan Lodge Committee (1934-1942, 1947-1948), Winter Sports Committee member since 1933, chairman 1947-48. Recreational skier in California since 1929, Sun Valley, Alta, Mount Hood, Yosemite, Lassen, Mount Bromley (Vermont); numerous ski-mountaineering expeditions in Sierra Nevada since 1933.

HAROLD EVANS, club skier in Donner Summit region for over 9 years, former partner with Jorgensen in Echo Chalet.

BARBARA FITCH HILDEBRAND, one of most active club skiers; twice winner of San Geronio Downhill (women), Sugar Bowl Ski Team 1947. Skied at Alta and Sun Valley.

GEORGE GESTER, active skier for about 12 years, one time captain University of California Ski Team, ski racing for many years in California (Donner Summit, Yosemite, Lassen) and Sun Valley, Alta. Vice president Sugar Bowl Ski Club, Vice president, California Ski Association, 1946-47.

ALEX HILDEBRAND, first captain University of California Ski Team, recreational skiing since late 'twenties in Austria, Switzerland, Donner Summit, Yosemite, Lassen, Shasta, Sun Valley.

FRED KLEIN, skier since boyhood in Austria. Ski instructor at Clair Tappaan Lodge for several years before World War II.

KEITH LUMMIS, manager Clair Tappaan Lodge since 1946. Skier before that.

RICHARD SPRINGER, member Ski Mountaineers of Southern California Chapter of club, skier at Sun Valley 1948 season while on staff there.

ALAN STILES, recreational skiing in Yosemite, Lassen, Sequoia, Sun Valley, Aspen, Donner Summit, Shasta. Active leader of ski mountaineering trips.

MARTIN WEGELE, long-time skier in Donner Summit region, member of TVN.

RICHARD H. FELTER, Sierra Club skier for many years at Donner Summit, Yosemite, Sun Valley, Lassen, Shasta, Hood. Former chairman of Winter Sports Committee, now chairman of Ski Terrain Survey Committee. Former Vice President, California Ski Association. (Not on May 15, 1948 trip, but on May 30, 1941 trip to Mineral King, reviewed draft of report.)

Will the Sierra Bighorn Survive?

By ARTHUR H. BLAKE

THE SIERRA BIGHORN, which John Muir once called "the bravest of all Sierra mountaineers," was once common all along the Sierra crest and was found even on Mount Shasta. Today it occurs only in the wildest and least accessible regions of the Sierra, mainly between the Palisades and Mount Whitney. What is its chance of survival?

So little needs to be done to find the answer to this question that it seems strange that it should have to be asked. At least four governmental agencies are—or should be—concerned in the matter of the survival of the bighorn; members of the Sierra Club have a very special interest; the California Academy of Sciences is coöperating. Nevertheless, no one scientist or layman can yet correctly say whether they are increasing, decreasing, or barely holding their own. Nor is it known whether their greatest enemy is the poacher, such predators as the golden eagle, or epidemic disease. As a layman unable to distinguish between *Ovis canadensis* and *O. nelsoni*, I find myself handicapped when discussing the bighorn's chances of survival. The mammalogist raises his eyebrows and tells me only scientific field study can give the answer. Quite true. But the question has remained, how much longer must we wait before scientists initiate action to find out?

The late Hall McAllister, who was a well-known Sierra Club member, maintained an alert interest in the survival of mountain sheep, whether Sierra or desert bighorn. He became a center of information on the subject, working closely with the California Academy and receiving many interesting and often valuable reports from observers. Otherwise the Sierra Club seemed almost apathetic until 1940, when the nature study group of the San Francisco Bay Chapter called the attention of the Directors to the apparent urgent need of taking steps to aid in the preservation of the species. A sanctuary was proposed—the area in Inyo National Forest in which it was thought the concentration was heaviest. This was east of Mount Baxter and extended from the crest down to an altitude of about 7,000 feet. The suggestion was approved and a Committee on Mountain Sheep was appointed, consisting of Joseph S. Dixon (then Field Biologist, National Park Service), Joel H. Hildebrand, Norman B. Livermore, Jr., and myself as chairman.

We went to work at once to enlist the coöperation of federal and state

organizations who were officially charged with such duties. Assistant Regional Forester F. R. Cronmiller called a general meeting of representatives of the California State Fish and Game Commission, National Park Service, the U. S. Fish and Wildlife Service, the California Academy of Science, and the Sierra Club. Discussion showed the need for a comprehensive fact-finding study to determine measures which should be taken to save, and it was hoped, to restore the species.

The sanctuary idea was not generally favored by the Fish and Game Commission because of the difficulty of enforcement which was expected. There was considerable discussion of the possibility of losses due to poaching and predation. It was also felt that in the lower altitudes there might be a feed problem where the bighorn came in conflict with domestic sheep, and that there might also be associated disease problems. The question of financing a scientific study was considered and it was agreed that the only funds available in the amount required would be from appropriations under the Pittman-Robertson Act. It was stated that the state's program of studies, restoration, and acquisition was then in such condition that it would not be possible to recommend additional studies at the time.

Since no immediate aid was in sight I suggested the employment of Norman Clyde, the well-known mountaineer, who had been reporting for years to Hall McAllister as an observer. Clyde could follow the sheep during the lambing season as they worked back up to the Sierra Crest, and could ascertain the loss by such predators as the Golden Eagle. A very small sum was raised but it was not sufficient to be attractive enough to justify Mr. Clyde's relinquishing time from other and more remunerative activities.

War came shortly after this meeting and activities had to be suspended, save an occasional reminder in the *Bulletin* that reports on mountain sheep were still welcomed. Many reports have reached the Committee on Mountain Sheep since then on both the Sierra and desert bighorn. These will be recapitulated in a later issue of the *Bulletin*. Here, however, are some of them—evidence which is not only of use to scientists but which also serves as a demonstration of the valuable contribution club members can make:

Girard Rosenblatt (August 22, 1942).—. . . enroute from Woods Lake to Division Creek via Sawmill Pass on August 22, a group of 5 Sierra bighorn was observed just south of the Pass at 11,200 feet. The flock appeared to consist of 3 rams and 2 ewes.

Tom Jukes (September 25, 1942).—On September 1, [Ted] Sanford, my wife and I walked up Mount Barnard from Tyndall Creek. Near the summit it became evident that the region above 13,000 foot contour was a favorite spot for mountain

sheep. There were many tracks, beds and recent droppings. In fact, Ted called attention to the pronounced odor of sheep. At about 13,500 feet on the west shoulder of the mountain I saw to the northwest two large rams standing about 50 yards away. They regarded us gravely and were not disturbed by our excited actions. They did, however, move away just as a movie camera was being focused on them. The summit register on Mount Barnard contains an entry by Czock which records seeing a band of sheep on the plateau between Mount Barnard and Williamson.

R. L. Johns (September 3, 1943).—While hiking in the basins about the foot of Mount Hopkins [Hitchcock] in the Whitney Region, I saw two fine rams. I came on one at a distance of about 300 yards. Both were in good condition.

(October 9, 1943).—I saw one ram in the same region.

John Stokeley (August 7, 1946).—Our party of three and two burros came over Junction Pass summit (13,000 ft.) from Center Basin and sighted four Sierra bighorn—one ram and ewe and an ewe or almost half-grown ram and a lamb. They saw us and went up toward Mount Keith. The entire Junction Pass plateau was covered with their tracks. Several sheltered spots behind large boulders had been pawed into sleeping pockets. They had apparently been living there for some time, judging by the quantity of tracks and droppings. The only vegetation there consists of tiny scattered tufts of succulents which have a yellow flower somewhat like a dandelion [*Hulsea*].

W. B. Treat (Mid-July, 1946).—Climbing with two others up the west shoulder of Mount Langley directly from Rock Creek just before reaching the summit plateau, we saw mountain sheep on the skyline about 100 yards away. I managed to get several pictures at an approximate range of 30 yards.

On January 12 of this year Mr. Fred L. Jones, a Sierra Club member who is the first to make a real study of mountain sheep, wrote from the Museum of Vertebrate Zoölogy, University of California. He had spent some months making a study of mountain sheep along the Sierra crest and the results were to be published sometime around mid-May, 1949, when he hoped the data gathered on his last summer's trip would be compiled and correlated. Writing of the bighorn, Mr. Jones said:

"They range almost continuously from Olancha Peak to Taboose Pass, mainly along the Sierra crest and on the eastern slope, though at times individuals or small bands may wander considerably to the west. There are a few spots in this range where sheep do not appear to be resident. The largest of these is the country bracketed by the crest between Mount Langley and Mount Russell on the west, Diaz Creek on the south, and Lone Pine Creek on the north. Another is the area immediately around Kearsarge Pass.

Around the head of Birch Creek and the head of the South Fork of the Big Pine Creek there seems to be a small bunch that is more or less completely isolated. There also seems to be a small isolated bunch that ranges at the head of Convict Creek. The only information that I have about this one is second-hand, but I am fairly well convinced there are mountain sheep there. These two bunches, plus at least three more or less distinguishable ones that inhabit the area from Olancha Peak to Taboose Pass, make a total of about five main groups. Each of these of course is composed of at least two and generally several smaller bands.

It is difficult to arrive at a population number with any degree of accuracy especially at this point, but from what I know I believe a total of 400 to be a fair estimate. . . . When I have gone over my notes completely and have evaluated all factors, I will be able more definitely and accurately to arrive at a figure.

I believe one is justified in concluding from the reports that the safety for the Sierra bighorn today rests in the inaccessibility of its range to the general public; we know they are most numerous in only the most rugged terrain, which seldom sees mankind save for an occasional mountaineer.

If adequate action is taken soon enough, perhaps John Muir's observation in *The Mountains of California* will not have been overoptimistic: ". . . but it will be long before man will take the highland castles of the sheep. When we consider how rapidly entire species of noble animals such as elk, moose, and buffalo are being pushed to the very edge of extinction, all lovers of wildness will rejoice with me in the rocky security of *Ovis Montana*, the bravest of Sierra Mountaineers."

Expansion Anchors in Climbing

By CHARLES WILTS

[Some thirty years have passed since a European mountaineering journal first depicted an adaptation for the climber of an expansion bolt—a device that can be securely expanded in a hole drilled for it in solid rock. Almost ten years have elapsed since American mountaineers first made use of expansion bolts by placing four of them for safety anchors in the ascent of Shiprock.¹ Six years ago Charles W. Hanks, then in the Mountain Troops, invented an anchor which could be inserted and expanded silently into parallel-sided, narrow cracks. In tests conducted for the Mountain Training Center this “silent piton” showed some promise, but there were too few places in which it could be used; it was never put into production, and the models were lost in Italy. All in all, bolts were used only sporadically until the direct ascent of the Lost Arrow in 1947, in which many anchors specially designed by John Salathé were placed where no other type of attachment to the rock was feasible, thus permitting a relatively safe climb of a route of extreme difficulty.²

There has not appeared in all this time an adequate study and presentation of the physical requirements of expansion anchors. We are therefore pleased to present here the contribution to a specialized aspect of climbing lore by Charles Wiltz, Assistant Professor of Mechanics at the California Institute of Technology and an expert climber as well.—ED.]

AS WAS TRUE with pitons, the advent of expansion anchors³ as rock-climbing equipment caused some controversy about the ethics of their use. It is not my purpose to debate the matter, for the arguments used by the piton pounders can be rallied to the defense of this equipment too. On the other hand, there has been too little controversy, or even reliable information, about the many expansion anchors available.

How strong should an anchor be? Since a clear statement of requirements is needed before one can assess the suitability of various anchors, the following is tentatively advanced:

¹ “It Couldn’t Be Climbed,” by DAVID R. BROWER, *Saturday Evening Post*, February 3, 1940.

² “Five Days and Nights on the Lost Arrow,” by ANTON NELSON, *SCB*, March, 1948, 33:3, 103-108, illustrated.

³ The more common term, *expansion bolt*, is not broad enough; some anchors do not consist of a simple bolt and threaded sleeve.

- 1) The ultimate strength in pounds should be (a) for stopping a fall, 2,000. (b) for direct aid on a climb, 500. (c) as a rappel anchor, 1,000.
- 2) The weight and bulk of accessories should be at a minimum.
- 3) The time required to drill a hole for the anchor should be short—somewhere around 15 minutes.
- 4) The anchor should be available commercially and should require only minor modifications or none at all.
- 5) The anchor should be readily retrievable.

Most of these points are not controversial; however, the figures for the required strength merit some discussion. A well-belayed fall of a leader may give rise to rope forces that approach 1,000 pounds without noticeable damage to the leader.⁴ Under such conditions rope is being paid out over a carabiner holding the fall, and the pulley effect around the carabiner will result in a force on the carabiner and its support which is nearly double that load, or about 2,000 pounds. Since pitons should never be relied upon to withstand a force in excess of 2,000 pounds, we need not require expansion anchors to hold more. If weaker anchors are used, an excessive number would sometimes be required because of the necessity of placing them at smaller intervals.

The average load on a direct-aid support is rarely larger than a few hundred pounds—the weight of the climber plus the holding force exerted by the belayer—so an anchor with strength of about 500 pounds could be used freely for this purpose if it were certain that such anchors would not have to withstand a severe fall of a leader.

Rappelling anchors should be stronger than those for direct aid since rappelling forces readily reach 500 pounds if the rappel is at all jerky. A strength of 800 to 1,000 pounds should provide a margin of safety. Some climbers believe that *two* expansion anchors should be used in setting up a rappel point [an important *requirement* with pitons]. There is then some recourse should one of the anchors happen to fail unpredictably.

Although the various uses do not all require the same strength, the use of different anchors is undesirable if they require holes of different diameters. Rock drills are rather heavy even when shortened for the rock climber's use, and the load imposed by more than one set of drills when added to that of all the other equipment is more than some climbers' backs can stand.

⁴ See "Belaying the Leader," by RICHARD M. LEONARD and ARNOLD WEXLER, *SCB*, December, 1946, 31:6, 68 for an excellent discussion of the forces arising from properly belayed falls of a leader.

PHYSICAL PROPERTIES OF ANCHORS AND DRILLS

A survey has been made of those expansion anchors which are readily available commercially. Although the survey is certainly not complete, it has included most of the common anchors. There are three basic types: (1) the shield and expansion screw are made into a single unit which can be removed from the hole after use, (2) the shield is "set" irretrievably in the hole and a bolt is screwed in for use, or (3) the entire unit is driven into the hole in such a way as to preclude easy removal. One from each of these types was selected for test. The characteristics of these anchors are given in table 1.

TABLE 1
CHARACTERISTICS OF EXPANSION ANCHORS
(Measurements in inches)

Name	Hole diameter	Length of hole	Size of expansion element	Material of shield
Molly	$\frac{5}{16}$	$1\frac{1}{8}$	6-32 screw	steel
Molly	$\frac{3}{8}$	$1\frac{1}{8}$	3/16 screw	steel
Rawl	$\frac{3}{8}$	$\frac{7}{8}$	$\frac{1}{4}$ bolt	steel
Dryvin	$\frac{5}{8}$	$1\frac{3}{8}$	$\frac{3}{8}$ bolt	zinc alloy
Star	$\frac{5}{16}$			
Dryvin	$\frac{3}{8}$	$1\frac{3}{8}$ $1\frac{7}{8}$	$\frac{1}{4}$ nail	steel

The Molly anchor is of the first type and is entirely removable. The Rawl dryvin consists of a nut and surrounding sheath which is driven into the hole. The nut lies at the back of the hole, and the sheath which binds the nut to the rock is flush with the surface of the rock. A bolt with any type of head may be inserted, but the bolt must withstand the entire load. The Star dryvin consists of a split steel sheath, and a steel nail. The sheath is inserted in the hole, and the nail is driven into the sheath, expanding it to produce a tight fit. The sheath has a shoulder on the end for holding any desired object against the surface. Thus both nail and sheath are effective in supporting the load if the load is applied parallel to the surface of the rock. Although these anchors are manufactured in many sizes, only those which were considered for rock-climbing use have been included.

Rock drills are made of hardened high-carbon steel. The drilling end is sharpened to chisel-like edges which chip away the rock under the impact of hammer blows. The star drill is more common, but masonry

twist drills, particularly the three-fluted type, are often used. Although claims have been made that one is more easily handled than another, there is little difference in drilling speed.

The time required to drill a hole is a very important factor since the usual conditions under which it must be drilled rarely permit any comfort for the driller. The drilling speed depends upon many factors, the most important of which are: depth of hole, diameter of hole, nature of rock, sharpness of drill, weight of hammer, strength of blow, and frequency of blows. Because of this it is difficult to give specific data. Indeed, even

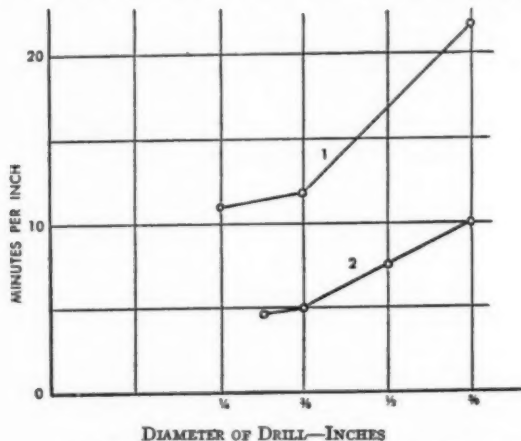


Figure 1—Typical Drilling Speeds in Granite
 1. Medium granite—data taken by G. Cunningham
 2. Soft weathered granite—data taken by C. Wilts

in igneous rocks of similar composition the age of exposure and weathering can be so disparate that the drilling speed will vary by a factor as large as two.

With star drills of various sizes, test holes were driven in two types of granite, one medium hard, and the other soft and well weathered. The measured drilling speeds are shown in figure 1. It might seem surprising that the drilling speeds for 1/4-inch and 5/16-inch holes are not greater than for the 3/8-inch hole. This is due in part to difficulties in handling a small drill and in keeping a small hole clean. Since holes larger than 3/8-inch require more time for drilling, and since larger drills are undesirably heavy, it is important to determine the minimum size of anchor and hole consistent with adequate strength.

CENTER STRENGTH OF COMMERCIAL ANCHORS

Tests have been initiated to determine which of the expansion anchors listed above fulfill the requirements discussed earlier. The principal strength criterion adopted has been the ultimate strength when subjected to a load parallel to the surface of the rock. In all tests, loads have been applied through carabiners to simulate as far as possible the expected loads. In some tests, where the anchor had inadequate strength, attempts were made to provide a satisfactory anchor by some modification of the existing commercial units.

TABLE 2
STRENGTH OF COMMERCIAL ANCHORS

Type of anchor	Diameter of hole (inches)	Length of hole (inches)	Yield strength (pounds)	Ultimate strength (pounds)
Molly ^a	$\frac{5}{16}$	$\frac{7}{8}$	150	400
Molly	$\frac{3}{8}$ ^b	$1\frac{1}{8}$	-----	-----
Rawl Dryvin ^f	$\frac{3}{8}$	$\frac{7}{8}$	400	850
Rawl (Modification I)	$\frac{3}{8}$	$\frac{7}{8}$	1000	1600
Rawl (Modification II)	$\frac{3}{8}$	$1\frac{1}{4}$	1300	2000 ^c
Rawl Dryvin	$\frac{5}{8}$	$1\frac{3}{8}$	800	2000 ^{+d}
Star Dryvin ^e	$\frac{5}{16}$	-----	-----	-----
Star	$\frac{3}{8}$	$1\frac{3}{8}$	2000 ⁺	2000 ⁺
Star (shortened)	$\frac{3}{8}$	1	1900	2000 ^c

^a Modified by use of larger screw to get greater strength.

^b Not tested. See discussion in text.

^c Crumbling of rock at hole contributed to failure.

^d Rock gave way at 2000 pounds.

^e Not yet obtained for test.

^f The eyebolts used with the Rawl anchors were provided by the Gerry Mountaineering Co., Ward, Colorado.

The results of the tests are listed in table 2. In addition to the ultimate strength, the load at which permanent "set" or bending took place is listed under the heading "yield strength." Since most of the data require qualifying and explanatory remarks, each type of anchor is discussed separately below.

Molly Expansion anchor—Since this anchor can be carried as a single unit (rather than in pieces) and is readily retrievable, it would be ideal for rock-climbing purposes if strong enough. It was hoped that the smaller sizes would be suitable for this application, but the tests of the $\frac{5}{16}$ -inch anchor showed it so unsatisfactory that the $\frac{3}{8}$ -inch size was not even tested.

Rawl Dryvin—The $\frac{1}{4}$ -inch eyebolt used with the Rawl Dryvin failed at a load of only 850 pounds. The mode of failure is illustrative of a fundamental weakness of this type of anchor. At a load of 400 pounds the eyebolt began to bend. The eye was actually bearing against the rock when the load reached 600 pounds. The load not only applied a shearing force at the base of the eye, but also a large bending moment (see figure 2). The bolt was thus subjected to normal stresses as well as shear stresses

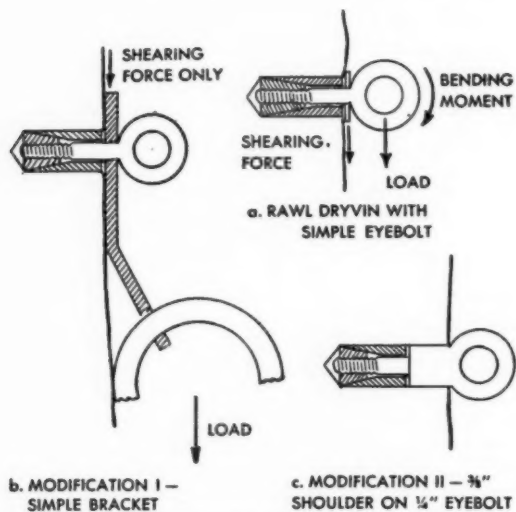


Figure 2—Rawl Expansion Anchor and Modifications

at the surface of the rock. In addition, the bolt was severely strained owing to the bending which had already taken place, and was substantially weakened by stress concentration at the base of the threads where it finally broke.

The maximum strength would have been obtained if the load had been applied as a shear force at the surface of the rock. Had this bolt been subjected only to a shear force, it probably would have withstood a load of about 2,000 pounds. An approximate shear loading was obtained by a simple modification in which the load was applied to a simple bracket held against the rock by the eye of the bolt (see figure 2). The great increase in strength afforded by this simple device resulted in an ultimate strength of 1,600 pounds, nearly a twofold increase. The use of an eyebolt

is, of course, not necessary when the bracket is used. However, the eye greatly facilitates installation.

A second modification consisted of a special eyebolt also shown in figure 2. This modification proved superior to the first; the ultimate strength exceeded 2,000 pounds.

The $\frac{3}{8}$ -inch Rawl Dryvin requires a $\frac{3}{8}$ -inch bolt. The eyebolt used for this test had a very large eye, thus insuring that the load would apply a large and undesirable bending moment. In spite of this, the anchor had a strength in excess of 2,000 pounds, proving that an expansion anchor of this size would be satisfactory for general rock climbing without modification.

Star Dryvin.—This anchor can only be used with some type of bracket such as is shown in figure 2. Both the shield and nail comprising the anchor are made of steel, so the shear load is applied to an effective cross section of steel with $\frac{3}{8}$ -inch diameter. Since the Rawl Dryvin of similar size has an effective diameter of only $\frac{1}{4}$ inch, it is not surprising that the Star anchor is superior in strength. The strength of this anchor is not known. The maximum load attainable with the test apparatus was 2,000 pounds. This load neither loosened nor bent the anchor.

One of the Star Dryvin anchors was shortened by $\frac{3}{8}$ inch in an attempt to investigate the feasibility of using this anchor with a shorter hole. The failure in this test, at 2,000 pounds, was primarily due to crumbling of the rock. This anchor would have adequate strength in harder rock, but the small reduction in drilling time is not of great importance. In very soft rock, the standard length anchor might likewise be unreliable. A longer anchor of the same diameter is available and may be used.

Questions regarding the durability of expansion anchors cannot be answered with certainty. The Rawl Dryvin should remain reliable indefinitely. The nut is plated to prevent rust and the anchor is tightened by a wedging action every time a bolt is screwed into the nut. On the other hand, the Star anchors cannot be tightened if they should ever loosen. However, these are also plated and should remain tight for many years. One anchor of this sort has been used more than two years for belaying leader falls at a local practice-climbing area without yet showing signs of old age. It is probable that the loosening of pitons by weathering depends primarily on the existence of a crack which can be widened by the pressure of freezing water. This effect should not appear when expansion bolts are used.

Another question which has been raised relates to the validity of static load tests, since the force produced by a fall has more the nature of an

impact load. It is believed that the force produced, at least when nylon rope is used, does not rise fast enough to produce what can properly be called an impact load.

CONCLUSIONS

The results of the test show that there are expansion anchors requiring $\frac{3}{8}$ -inch holes with sufficient strength for all rock-climbing purposes. It is therefore not necessary to consider the larger expansion anchors. Two of the $\frac{3}{8}$ -inch anchors which were tested had an ultimate strength greater than 2,000 pounds, thus proving satisfactory for the belaying of leader falls. One of the anchors consists in part of a relatively expensive eyebolt which can be readily removed after use. The other is inexpensive but irretrievable and hence would normally be left in place. It may be that the choice between the two should not be made on the basis of strength or economy alone. Perhaps I am unduly sensitive about such matters, but the idea of leaving a route studded with permanent "ironware" is repugnant to me. It is not an objection to having the anchors available to later parties without the work of drilling, nor a question of their reliability, but solely an objection to the appearance.

Those disagreeing with this view will do well to adopt an anchor such as the Star Dryvin for general rock-climbing use, but those agreeing with the principle of leaving a route clean when possible might prefer the following *series* of anchors:

1) Rawl Dryvin, simple $\frac{1}{4}$ -inch eyebolt and simple bracket (hole diameter, $\frac{3}{8}$; length, $\frac{7}{8}$; strength, 1,600 pounds) for direct-aid supports and rappelling anchors.

2) Rawl Dryvin, special $\frac{1}{4}$ -inch eyebolt with $\frac{3}{8}$ -inch shoulder (hole diameter, $\frac{3}{8}$; length, $1\frac{3}{8}$; ultimate strength, over 2,000 pounds) for belaying leader, except on soft rock.

3) Star Dryvin ($\frac{3}{8}$ -inch hole, $1\frac{3}{8}$ -inch and $1\frac{7}{8}$ -inch length) for use in soft or rotten rock.

Usually enough is known of the character of a given climb to permit choice of a suitable assortment. The anchors in this small size are so light that the weight of an assortment is not objectionable.

Seen from a Saddle

By ARDATH DIETRICH

IF YOU'VE always wanted a horse of your own, but for one reason or another have never had one, the saddle trip is the next best thing. For the duration of the trip you own a horse. You don't have to feed him, or brush him down, or saddle him, or see that he has shoes on his feet. You just say when you want him and he is there, waiting to take you on a thrilling ride. And if he is a good, sure-footed trail horse, as was my "Babe," and has brought you safely over tortuous Kearsarge Pass, you learn to trust him, even when he is bringing you down that breathtaking precipice that drops sheer from Foresters Pass, where at every hairpin turn his head and neck are standing out over empty space and his feet are inches from the edge of nowhere.

There were nineteen of us on the trip, a group of people of diverse professions—an orthopedic surgeon, a general physician of a hospital, the chairman of the home economics department of a university, an accountant, an author of technical books, a dress shop owner, a university student, and so on, whose extra-professional skills included photography, mountain climbing, folk dancing, horsemanship, music, and fishing. The battery of cameras was very imposing; we had evidence of the mountain climbing; and proof of the fishing was in those long, delicious golden and rainbow trout frying on the stove every evening about dinner time.

When we left Onion Valley on Wednesday morning we were, for the most part, strangers, and as we zigzagged, single file, across the mountain sides, climbing ever higher toward Kearsarge Pass, there was not much opportunity for getting acquainted. Sometimes we looked up or down at those riding above or below us, and smiled and made some comment, but generally we were silent. Most of us, I think, were seeing the Sierra for the first time, and perhaps the majesty, and the immensity, and the utter peace of our surroundings left us a little hushed.

It was probably our first wilderness evening meal that really brought us together, for what can create a more friendly atmosphere than ravenous appetites, good food to satisfy them, and a warm stove to huddle around? Or the mutual ownership of faces red, hot, and dusty, of knees giving off a creaking sound, and of spots of disconcerting tenderness?

That night at campfire we discovered our string boys and packers. They were an exceptional lot—young, handsome, clever, and talented.

We loved them. They could sing, and play musical instruments, and make speeches, and give readings, and be just generally witty and entertaining. And the hips on those boys! The little, tiny hips! I am resolved to do more horseback riding.

We had camped near Center Basin, a lovely spot of sunlight and shade, beautiful views, a cold clear tumbling stream, green grass, and stately pines. The sunsets in this region were particularly beautiful. The rays of light slanted across the rocky faces of the mountains, making interesting shadow patterns that changed and moved and grew deeper in tone while the upper peaks still glowed with sunlight. It was just the spot for a lazy day. Some rode or walked the four or so miles back to Base Camp (which we had passed the afternoon before) to accept an invitation to afternoon tea, some fished, read, hiked a little, took pictures, or sat or lay around and talked.

No matter what we did on any day, there was always our evening meal to look forward to. Doris Steele was our chef de luxe, and a better, more cheerful provider of delicious, wholesome and plentiful food never lived. For instance, we had—believe it or not—fresh corn on the cob; thick, juicy steaks; a big mouth-watering ham baked in our own camp oven; date cake; light, fluffy biscuits stirred up by our leader, Bud Steele; and always a fresh, green salad.

It was a beautiful morning when we left Center Basin. (In fact, all of our mornings were beautiful, as well as our noons and our nights. Not a drop of rain fell.) Everything looked fresh and clean. The grass was still wet with dew, the bare mountains gleamed in the morning sun, the sky was deep blue. The creek, running across the meadow near the trail, foamed over the rocks and stirred the shrubs and grasses along its banks with the current of air it created. The horses stepped along as if they, too, were glad to be alive and going somewhere. I heard someone behind me say, "Gee, this is beautiful. I'm glad I came. I'm sure glad I came." I think he expressed the feelings of all of us.

Almost immediately we began to climb, circling and winding among the mountains, looking down on deep, clear lakes set in treeless rocky slopes, crossing boulder-strewn flats, stopping now and then to let our horses drink from some little stream.

Presently we were looking at a sign which said "Foresters Pass. Elev. 13,285 feet." Whew! 13,285 feet! But wait. Figures are meaningless. Seeing is believing. Babe took a few steps forward and passed through a narrow opening. For a second my heart stood still. There was a perceptible gasp for breath. Suddenly we had come to the edge of a preci-

pice. The world lay below—far, far below—a magnificent world of mountains and valleys, forests, lakes, plains and rivers.

We started down, human mites inching back and forth across a vertical plane. Never, all my life long, shall I forget the descent from Foresters Pass. No matter how safe you feel on your own two feet, there is something about being astride a horse in so high and steep a place that gives you the terrifying feeling of being atop an unstable steeple. When I am ill and nightmares plague my sleep I know I shall dream that Babe set down her foot just three inches too far out, and, I with her, went pitching over the side, turning over and over as she fell through space. And I shall wake up screaming, but then I shall remember that Babe never once miscalculated her distance, that she was a wonder at picking the best spots, and that she never put the weight on one of her dainty feet until she had made sure that what lay beneath was solid clear to China. Bless her!

At last we were down. Good old flat earth! Good old solid, sun-baked boulders! We sat on that good flat earth and on those solid boulders and ate our lunch and craned our necks up at the rock wall before us, marveling that anything without suction-cup feet could possibly have descended it. We wondered how this trail had been blasted out of solid rock, and about the men who had done it.

Since my return from the saddle trip, a friend has shown me a note, written in the days when this trail was being scouted out, and left at Foresters Pass by a Forest Supervisor for a Park Official. It may be of interest to those who know Foresters Pass.

PARK OFFICIAL

7/14/30

This is Forester Pass.

We will run our trail almost north and follow ridge down and crossing to east between the big lake and the little one, then follow the creek down. Figured your side to go west around cliff until you strike bottom.

Took another look at pass above East Lake and it is much worse than this and snow conditions are worse.

We are camped $\frac{1}{2}$ mile below timber line in Center Basin. Will go out on 16th.

Junction Pass not open. Horse killed and man hurt three days ago trying to cross.

CUNNINGHAM *Forest Supervisor.*

As we sat gazing upward at Foresters, someone said, "Here comes the first string." High up in the pass there were a few dark moving specks. It was a long time before they started down, and one of the boys said they were untying the mules so that if one fell it would not drag the whole string with it. Breathlessly, for we had been there, we watched those dark specks move back and forth across the wall, becoming larger and larger as they descended, until they finally became a packer on his horse

and four or five well-packed mules. The packers are very proud of their strings, and justly so. To pack mules so their loads will "ride," and to bring the whole string down safely, single-handed, from Foresters Pass is no little achievement. Just to have come down that near-2,000-foot precipice on horseback was to me a feat worthy of honor. My pride in it has been somewhat squelched, however, by those who have called me a fool.

This was a strenuous day. Long before reaching camp we were tired, stiff-legged, numb-footed. The horses plodded along wearily, almost too worn out to put one foot before the other, stumbling a little now and then, too tired to be careful. Every valley we came to we thought was it, our camp, but we rode on and on. It was a welcome relief when, finally, late in the afternoon, after a seventeen-mile ride, we turned the brow of a hill and saw below us horses and mules grazing in the meadow beside Wright Creek and smoke rising from the pipe of our camp cook stove.

We were to spend four nights and three days at this camp. There were trips by horse to Wallace and South America lakes, and there were blazing camp fires every night. We needed them. The nights were always cold and there was ice every morning.

Throughout the trip there were times, I suppose, when each of us wondered why he had come—times when we were dead tired, when our legs ached and our feet were numb from inactivity, when we were cold to the bone, when the dust on the trail was so thick we gasped for breath, when our hands ached with cold after washing in the creek early in the morning, when our sunburn was painful, when we were dirty and had no place to bathe, when our sleeping bags crawled with ants—but the memory of all those things recedes and even becomes pleasant in distant retrospect, while the things that made the trip an adventure in living will stay bright in our memories. Though I may never again see the High Sierra, I shall always remember the incredible blue of the sky by day, the clean brilliance of the stars by night; the good taste of water from a cold, running stream; the wonderfully refreshing feeling of dangling my bare feet in the creek after a hot hike or ride; the odor of steaks broiling or ham baking when I was starved; waking early enough in the morning to lie there awhile, warm, comfortable, and content, looking at the sunlit pines against the blue sky. I shall never forget waking in the night to the sound of a horse cropping grass close to my head, and lying there, motionless, holding my breath, wondering if he would step on me, hearing his cropping get farther and farther away, and then looking out to see his dark shape still outlined against the starry sky, and finally, to

hear him clomp, clomp away, his hoofs striking against the stones and rocks. Nor can I ever forget the far-away shouts of the boys wrangling the horses, the cloud of dust appearing down the canyon, the neighing of the horses, the thunder of their hoofs and the mad scattering of rocks and pebbles as they came tearing out of the dust, the wranglers swinging their ropes in the air, half standing in their stirrups, shouting above the din. I'll remember Bud Steele, or one of the boys, coming crashing down the mountainside on his horse, dragging a big log for the campfire; the cry of a far-away coyote; little deer, racing across the clearing, bounding in and out among the rocks; Tommy Jefferson, playing his guitar and singing "She Never Said a Solitary Word"; waking in the night to see the camp fire, whipped by a high wind, sending long roaring sheets of flame across the clearing; the excitement of mounting and getting away in the morning. And I'll remember more than any of these other things, the beauty and majesty of the mountains, throughout the days and nights; the peaceful meadows; the deep, clear lakes; the tumbling streams.

On Tuesday morning we left our "home" on Wright Creek. For most of that day we rode through a beautiful pine forest. It was like another world. Contrasted with the blinding brilliance outside, the forest was pervaded with a subdued radiance, like light coming through high, stained-glass windows. Here and there the sun sent down a golden shaft, spotlighting a bed of ferns, a cluster of cones, a copper tree trunk. It was very still. High up, the tips of the pines swayed a little against the sky, but the lower branches and the ferns beneath were motionless. To have seen a deer moving through that sunlight and shadow, or to have heard a bird singing some sweet melancholy song would have been—but nothing happened to disturb the hush. The quiet was so deep and abiding that even the passage of our horses seemed not to affect it. Their feet fell upon the soft earth with gentle thuds and even their whinnys and snortings were here somehow subdued, as if they, too, felt the spell. It was as though nature had sound-proofed this place and set it apart from the mad world—a High Sierra sanctuary.

We made our last camp at Timberline Lake, in a valley sheltered on both sides by high rock walls and towered over at the upper end by Mount Whitney and its companion peaks. Measuring it in feet, we had been closer to heaven at other times on this trip, if heaven is up; but for beauty of line, color and arrangement, we had seen nothing so near to paradise as this. Elsewhere, too, there had been lakes shimmering in the sunlight, or lofty peaks, or streams tumbling over rocks, half hidden by overhanging shrubbery, or green meadows, or rocks and windswept

pinces, but it was the way all these were put together here that filled us with wonder that any place on earth could be so perfect.

From the moment of our arrival there seemed to be an undercurrent of excitement, a feeling of expectancy, as on the eve of a holiday. Tomorrow was the day, the climax of our trip. Mount Whitney loomed above us, challenging, yet, sphinxlike, revealing none of its secrets.

And so to bed. Tomorrow was to be a big day. Up Whitney, down Whitney, and on to Whitney Portal—twenty-three miles in all.

Did we sleep well that night? In the shadow of Whitney? With the ranger's words ringing in our ears?

What *can* I say of Whitney? We climbed it. Rather, our horses climbed it, panting and struggling, and beating their hearts out to carry us up. The ranger had not exaggerated. There were places where the trail was dangerously narrow, most of it having slid off into space. The rest was on the verge of following, and at every touch of a hoof more sand and pebbles went rattling downward. At the switchbacks there was scarcely room for a horse to turn and the footing was so insecure, being only loose, sloping sand and gravel, that Babe sometimes slid back a foot, two feet, almost to the very edge.

Near the top we crossed a long, narrow ledge. Here it seemed that anyone that reckless could have stretched out his left arm and dropped something, straight down, unimpeded, thousands of feet below, or flung out his right arm and touched a perpendicular rock wall. But the tendency was not to stretch or fling out one's arms, rather it was to sit tight, unmoving, every nerve and muscle taut, drawing the body into a hard knot. Sometimes the wall opened into a window and then we had no solid thing on either side to give us comfort.

There were places where the horses had to step down a foot and a half, or two feet, with nothing to step upon but a jumble of loose, uneven rocks and stones. One such place was on that narrow rock ledge, and here the ledge curved inward. One false move on Babe's part would have sent us plunging into space, and she knew it. She stood motionless for a long time, looking at it, studying it, while my heart stood still and the world spun below. She put one foot out, lowered it carefully, testing the solidity beneath. Then the other foot went down, and there was a sickening drop of the forepart of her body. Now the hind legs must come down too—a maneuver she accomplished with a kind of scrambling motion. So painfully slow and wary is movement on a pin point on top of the world! We moved along the trail again, but any elation I might have felt was crushed by the thought that we were not yet up, and that

we would have to come down. Behind me, as someone else reached the same spot, I heard a girl, in the most awe-stricken voice I have ever heard, say, "Oh, my God!"

Mount Whitney is flat on top and covered with huge boulders, and I am convinced without measuring that it is the highest point in the United States. We signed the register, ate our lunch—which Cognac, our pretty little prize-winning mule, had so kindly brought up for us—and made ourselves dizzy walking around the edge and looking down. There was no fog, cloud, or haze, and we had an unobstructed view of the "great, wide, beautiful, wonderful world."

I walked down Whitney, and I was not alone. When the man who had ridden up behind me told me that once Babe had put out a hind foot and found nothing to put it on, and had stood there for a while waving it around in space, still finding nothing, that was the last straw. I enjoyed the hike down. It was good to be on foot, and I am sure Babe was glad to be without me. The view, seen with safety, was infinitely more magnificent, the open windows held no terrors, the switchbacks were something to be romped around, and there were beautiful flowers not seen at all on the way up.

At the base of Whitney the others went on, but I sat down in the shade of a big boulder to wait for Babe. I had blisters under both heels.

There I waited an hour in the most tranquil, the most soothing, the most dreamy quiet I have ever known. I was absolutely alone in the world. Once, I think, a bird did fly across the sky, not flapping its wings vigorously, but sailing dreamily, effortlessly. There was no other movement and no sound at all. This, too, was like another world but unlike the forest; here the sun bore down with its full vigor upon the barren slopes and the myriad rocks and boulders which nearly covered the gravelly earth. No green thing was in sight—not a tree, nor a blade of grass.

All the rest of the day we went down, down, down. Every lake, every stream, every meadow was different, yet all were beautiful.

When, late in the day, we rounded a turn at the top of a canyon, and voices from far below floated up to us, and Babe began to prick up her ears and look down and step livelier, I knew that we were getting close to Whitney Portal.

And when we were there and they took off Babe's saddle and put her in the corral, she lay down on the ground and rolled over and over in glee to be free of me. I wished that I could do something for her. She had done so much for me!



Sierra Club

To explore and enjoy the mountain regions of the Pacific Coast; to publish authentic information concerning them; to enlist the support and coöperation of the people and the Government in preserving forests and other natural features of the Sierra Nevada

JOHN MUIR, President 1892 to 1914

OFFICERS AND COMMITTEES FOR THE YEAR 1948-1949

BOARD OF DIRECTORS

FRANCIS P. FARQUHAR *President*
LEWIS F. CLARK *Vice-President*
RICHARD M. LEONARD *Secretary*
ROBERT L. LIPMAN *Treasurer*

ANSEL ADAMS PHIL S. BERNAYS DAVID R. BROWER
WILLIAM E. COLBY GLEN DAWSON WELDON F. HEALD ALEX HILDEBRAND
OLIVER KEHRLEIN NORMAN B. LIVERMORE, JR. CHARLOTTE E. MAUK
BESTOR ROBINSON

HONORARY PRESIDENT: JOSEPH N. LeCONTE

HONORARY VICE-PRESIDENTS

HORACE M. ALBRIGHT, NEWTON B. DEURY, RANDALL HENDERSON, JOEL H. HILDEBRAND, WALTER L. HUDER, DUNCAN McDUFFIE, FREDERICK LAW OLMSTED, MARION R. PARSONS, ROBERT G. SPROUL, WALTER A. STARR, RAY LYMAN WILBUR, WILLIAM H. WRIGHT.

COMMITTEE CHAIRMEN

Conservation: ARTHUR H. BLAKE; *Editorial:* DAVID R. BROWER; *Library:* ALFRED E. WEILER;
Lodge: ALEX HILDEBRAND; *Membership:* E. W. CUNNINGHAM; *Mountaineering:* MORGAN HARRIS; *Natural Sciences:* MILTON HILDEBRAND; *Outing:* RICHARD M. LEONARD; *Visual Education:* KENNETH D. ADAM; *Winter Sports:* EINAR NILSSON.

CHAPTER CHAIRMEN

Loma Prieta: RUSSELL H. VARIAN; *Mother Lode:* H. I. SHARMAN; *Riverside:* KENNETH M. BUCK;
San Diego: IVY B. FOSTER; *San Francisco Bay:* EDGAR WAYBURN; *Southern California:* E. W. CUNNINGHAM.

ASSISTANT SECRETARIES

VIRGINIA FERGUSON

CHARLOTTE E. MAUK

Reports

HIGH TRIP OPERATIONS AND THE USE OF MEADOWS

By **LOWELL SUMNER**
Biologist, National Park Service

AT THE REQUEST of various officers of the Sierra Club, I made a study of the club's annual High Trip operation, July 4 to 12, in Sequoia and Kings Canyon national parks. Those in charge of the High Trip have been exceedingly active in trying to work out methods of minimizing the meadow damage that almost unavoidably accompanies any large group of travelers in the mountains.

Besides desiring suggestions for still further reducing meadow damage, the club felt that the service too would benefit from such a study, through an appreciation of the complex problems involved in bringing such a large party, and so many head of pack stock, into the wilderness. Stock-handling methods that had been recommended in previous reports on the basis of small pack strings should be tested, the club felt, on a large-scale operation.

In arranging for this study, the club most generously relieved the National Park Service of all expenses connected with the trip, which, in view of the critical shortage of departmental travel funds, was deeply appreciated.

SUMMARY AND RECOMMENDATIONS

As a result of more than forty years of experience in organizing large-scale outings, and much thought on behalf of conservation, the Sierra Club's operational methods have become so highly efficient that it is difficult to suggest further improvement. The organization's average of approximately one-half animal per person (actually .45 mule per person) contrasted strikingly with the ratio of four animals per person observed for another party met on the trail. It is better than my own ratio, believed to be conservative, which in various years has averaged between two animals per person and three animals per two persons, the latter ratio finding the animals quite heavily loaded. The greater efficiency possible in a large-scale operation partly explains the Sierra Club's low animal ratio. The rest of the explanation lies in rigidly enforced weight restrictions and the willingness of club members to walk, which eliminates the need for a large number of saddle animals.

Sometimes one hears other camping parties refer to the Sierra Club Annual Outing as "that band of locusts," but a study of the facts proves this to be unfair. I have seen no other group so conscientiously burn its tin cans and bury its garbage to avoid unsightliness and to prevent bear trouble. By contrast, choice wilderness camping spots in secluded areas known only to long-time local residents usually are notoriously plastered with unburied cans, beer bottles, and other refuse.

The Sierra Club's operation actually is slightly undersupplied with stock from the standpoint of maximum mobility. Approximately 138 paying guests, plus 15 packers and 22 commissary members, with all their equipment, were served by 52 pack animals and 21 saddle horses. However, this number of animals was unable to carry all of the load at one time. As a result cooking equipment and the most urgently needed supplies were brought to camp on the first trip. Then while certain strings of mules rested, others went back for a second load. Later these were allowed to recuperate

while the rested strings took over the relay work. The magnitude of the operation may be judged by the fact that the club consumed eight tons of food for the four weeks.

The most obvious suggestion, for purposes of protection, is that certain well-beaten routes, like Paradise Valley, be avoided. However, Sierra Club leaders point out that the club retraces a given route only at intervals of seven or eight years. One feels a certain unfairness in suggesting to a group that pioneered many of these favorite routes years ago that it now relinquish them to other parties who leave less tidy campgrounds, use stock less efficiently, and give far less thought to conservation.

However, a better distribution of the travel load might be secured by using additional areas that have been largely neglected in recent years. For example, trails of a sort exist into the scenic Monarch Divide region between Dougherty Meadows and the Gorge of Despair; however, these trails are hardly ever used at present. Similarly, an outstanding but neglected region lies to the east of Dougherty Meadows, between the Copper Creek headwaters and Kid Peak. Superintendent Scoyen has been working on a program for making these, and other areas such as Gardiner Creek basin, more accessible. It appears that it is up to the National Park Service to improve and mark the existing trails into such regions as promptly as funds can be made available. A little money would go quite a long way in this particular terrain. Then it would be up to the Sierra Club and other similar groups to give these new areas a fair trial.

The various local packers should be actively encouraged by the Service to take some of their clients into the new areas instead of restricting their operations to certain worn-out routes as at present. Installations of a few drift fences by the Service in these new areas probably would do more to persuade the packers to try them than any amount of conservation propaganda.

The Sierra Club's suggestion, that all large parties using stock arrange their itineraries with the Superintendent in advance, should be adopted next season. Some groups already have done this. All could be brought to comply by requiring the packers with whom they had made reservations to notify the Superintendent. If enforced tactfully, this regulation would function as a means of reserving some forage for each party, eliminating the present unorganized, destructive, and largely unnecessary grazing competition between parties. If we can reserve accommodations for visitors in developed areas, why can't we reserve certain forage days for the major parties that use the meadows? With California's population growing so enormously, it appears that we shall have to choose between arranging such reservations or allowing many strategic meadows to vanish in the near future.

If funds can be allocated for establishing the system of trail bars and short drift fences, plus limited stopovers in a few special areas, that were outlined in 1941,¹ convenience will prove the best possible inducement for tourist parties and packers to adopt the particular routes and meadows chosen by the Service for major use, on considerations of protection as well as of scenery.

USE OF HAY

To save the badly overused meadows at Paradise Valley, first stopping point beyond Cedar Grove, the Sierra Club agreed to haul in baled hay and keep all stock tied up.

¹ Special Report on Range Management and Wildlife Protection in Kings Canyon National Park, by Lowell Sumner, May, 1941. 288 pages.

Two nights were spent at Paradise Valley, which necessitated making several trips for sufficient hay. The extra expense involved is typical of the sincerity of Sierra Club conservation efforts.

Originally it had been suggested that the club stock be taken up the steep, practically abandoned trail from Paradise Valley to Goat Mountain, where the animals could be turned loose in a series of unused meadows. However, an inspection of this trail on July 6 proved the impracticability of this suggestion. The trail, though not long, is very steep and brushy and has not been maintained for years. If all the animals could have been taken up there the first night, without having to work again until the end of the second day, this procedure might have been feasible, though difficult. But, since the club verged on an actual shortage of stock, the animals were used every day in several relays to bring up additional supplies; therefore, they could not be taken so far from the operating area.

Transportation of hay into Paradise Valley appears to have brought no ill consequences, although the bales were not wrapped in tarpaulins as specified originally (probably because there were not enough tarpaulins). Very few wisps of hay were rubbed off along the trail by contact with trees. One flake of the baled hay was dropped during a minor mixup with the stock, but was retrieved later.

The spot where the hay was fed was under pine trees, far from any meadow and entirely unobjectionable from a biologist's standpoint. Some of the packers complained privately that there was not enough level area for all the stock, which was true. However, it is believed that another time an adequate area could be found. The present one was selected primarily because it had been used as a Sierra Club camp-site in previous years, when hay was not hauled and stock not tied up.

Enormous harm to the sick meadows in Paradise Valley was averted by this hay-feeding operation, and it is believed that the practice should be requested of other large parties, and eventually of all parties, regardless of size. The expense of hauling hay to Paradise from the road ending was nearly \$30 a ton which, added to the purchase price of approximately \$30 a ton, about doubled the original cost. It is for this reason that it becomes economically impracticable to haul hay much more than one day from a road ending.

LARGE VS. SMALL PARTIES IN RELATION TO IMPACT ON MEADOWS

In general, it is not people who damage the meadows but the trampling hooves and injuriously selective feeding of their livestock. Therefore, with respect to meadow protection, parties having the fewest number of animals per person should be considered the most desirable. The Sierra Club party's unusually low ratio of approximately one-half animal per person is believed to represent the lowest possible for any extended trip.

Of course, one large party attracts more attention in the Sierra than a daily succession of small parties but, if the impact on the meadows is measured in terms of horse days of forage per day of camper use, one is forced to concede that less damage per person results from a large-scale efficient operation like the Sierra Club's than from most of the smaller parties. Moreover, the Sierra Club, because of the number of stock involved, adds one packer—the nighthawk—whose sole duty is to push stock into (and later to retrieve them from) relatively unused meadows not accessible to small parties camped at any given, much-used site.

However, the fact still remains that the presence of large numbers of people,

including Sierra Club members, in a wilderness is bound to involve some damage from livestock, but the remedy seems to lie in the direction of bringing the operations of other groups, large and small, as close as possible to the high degree of efficiency shown by the group covered by this study.

Certain packers are said habitually to use an excessive number of stock instead of relaying supplies with a smaller number of animals. By contrast, the Sierra Club mules were conspicuously busy even on days when the club remained for two days at a given camp site. In fact, sometimes the club was forced to alter its schedule and lay over an extra day to permit the mules to catch up with their work. At one camp members were temporarily on short rations because certain important items did not arrive with the first load. One packer had to backtrack and camp alone for two days to bring up the last of the provisions.

One of the conclusions reemphasized by this field study is that the situation will be helped materially, especially in regard to the numerous small parties, by construction of the relatively inexpensive trail bars and drift fences advocated in a previous report. The resulting convenience would secure more universal cooperation than almost any amount of coercion.

Mountaineering Notes

Edited by MORGAN HARRIS

CLIMBING IN JASPER PARK—1948

In early July, Ruth and I returned to the sparkling glaciers and soaring peaks of the Canadian Rockies. This time, we chose Fryatt Canyon, and backpacked in intermittent showers. Our second camp was established near the base of the beetling crags of unclimbed, frowning Brussels Peak. The roll call of previous attempts read like an illustrious Who's Who of the climbing fraternity, and it was apparent that the First Step had repulsed good cragsmen. Don Woods and Fred Ayres, who had just worked upon the mountain, had given an interesting history of the peak.

The next day was fair, and we ascended to the Brussels-Christie Col. Roping up, we proceeded along the upper rim of the east glacier, then up the shattered north ridge of Brussels. After passing a number of pitons in the steep pitches, the generally easy climbing suddenly ceased against the towering, firm, almost flawless First Step. Scanty information had indicated that the entire peak was composed of loose rock, with pitons of little use. Consequently, my stock consisted largely of long pitons and angles, and I thought woefully of bolts and drill far away. A short portion of the steep, firm rock was covered, but it seemed wise to leave the climbing for braver, better-equipped men. A traverse to the right upon unsound rock followed, but the bulges above were rather hopeless.

A long, damp, shallow, rotten chimney to the left of the First Step was attempted next. This would have led to the base of the Second Step. Some distance above the lonely piton of some predecessor, my attempts merely split the soft rock far below the dripping overhang at the top. As a last resort the couloir far to the left was studied, and ruled out because of the intermittent cascades of snow and rocks. Once, on the rappels downward, I counted five falling rocks that thudded simultaneously about; it is useless to attempt to dodge under such circumstances.

Two days later, the south face of the peak was inspected from the Brussels-Lowell Col. Since this aspect of the mountain was even less favorable than the north side, we decided in favor of the latter. With the day still young, our attention was directed toward the other target—the unclimbed Northwest Ridge of the Northwest Tower of Lowell. After cutting steps for some distance we gained shattered, rather steep rocks. Aside from the unceasing caution required by the loose holds, the cliffs were not difficult. Leads were alternated up the limestone, and Ruth gained the summit first. While the marvelous view was being admired, clouds were marching nearer from the Catacombs and Chisel.

Descending proved to be quite hazardous. Ruth descended an almost vertical, debris-choked chimney. When I started to negotiate the bad pitch, great caution was insufficient to prevent my dislodging a large rock that narrowly missed her; comments floated up in the dusty air, and a perpendicular but relatively sound wall was chosen by the writer. It was then felt that the worst was over, but a storm had been crouching south of the mountain, and pounced over the crags. Lightning, high wind, and hail impeded our progress. After traversing a steep snowbank that required handholds, we entered a drafty cave to wait out the worst of the storm. After a deafening crackle Ruth calmly remarked, "I felt quite a shock! Wouldn't someone be startled

if, years later, he chanced to peer in and saw us?" Little did we know that, a few days later, Death would similarly stalk, then strike a party of friends, fellow Sierrans, on Bugaboo Spire.

Eventually the storm thinned sufficiently for us to continue the descent, and we reached camp somewhat battered. That night the mountains added insult to injury, for a tiny, nearby tarn suddenly arose in wrath and forced us to flee to higher ground. The two bedraggled individuals hopping around salvaging equipment must have been the most comical sight ever seen in the canyon! I finished the night looped over bushes like a boa constrictor, while Ruth slept upon an impossible slope.

The next day Mr. and Mrs. Ray Garner, with Teton guide "Jiggs" Lewis and Ed George, passed through en route to Brussels. Their party was wisely equipped with a dozen "tamp in" bolts and another dozen in reserve. Giving them information and best wishes, we regretfully headed outward from the impressive group of peaks that rings the canyon. A few days later the party gained the summit of Brussels, conquering the First Step by means of a measured 130 feet of praiseworthy rock work on the first day. A fixed rope was left above the two safety bolts, and the Second Step was turned two days later, with lightning and snow greeting the victors on top.

JOHN D. MENDENHALL

THIRD NEEDLE OF MOUNT WHITNEY—EAST BUTTRESS

An interesting route was made up the east buttress of Third Needle—southernmost summit of Mount Whitney—September 5, 1948. John D. Mendenhall, Ruby Wacker, and John Altseimer found the ascent to be largely class four and five, with a strenuous class six pitch at 13,600 feet. The climb starts where Pinnacle Ridge meets the east wall of the Third Needle, and follows the crest of the buttress to a point just north of the 14,150-foot summit. Although not as direct as the East Face Third Needle Route pioneered by Ruth and John Mendenhall in 1939, the new climb affords exposure for a longer period of time. The southerly side of the buttress is followed most of the way. The class six pitch is on the east face of the rib, and a traverse into a rotten, bottomless chimney on the northeast flank follows some distance above. The final tower is turned by means of a shift from the south to the north side of the ridge, and a providential ledge is followed to the top. The climb is especially convenient for Mirror Lake mountaineers.

JOHN D. MENDENHALL

A NEW ROUTE ON MORO ROCK

This story starts several years ago. In 1939 a group of climbers from the Southern Chapter made what is believed to be the first climb on Moro Rock. The climb started from part way down the West side (valley road side) and came out on the trail up to the summit.

In 1941 I prevailed on several others from here to go to Sequoia and scout the Rock with me. We started down the east side from the parking area and circumvented the entire Rock, trying various routes that looked feasible as we went along. Finally we started on what appeared to be a route that "would go." However, after a little reconnoitering on my part ahead of the rest of the party, a view was had of the main face along the nose of the Rock, and there appeared to be some difficult cracks ahead. Since time was against us, we then turned back intending to return the following year, and if possible complete the first ascent from bottom to top.

The war prevented any further climbing on Moro Rock until October of last year,

when several of us made a trip to Sequoia for that purpose. This time the weather was against us but we did climb the route that starts part way down the Rock.

On October 2-3 of this year I was again leader of a trip to make the climb "or else." There were approximately 20 of us, including two girl climbers, Mrs. Ruth Mendenhall and Mrs. Charles Wilts. Several climbs were made including the "old" route, and an extension of that route. Also, two ropes, one made up of myself as leader, with George Harr as second man, and the other with Harry Sutherland and Bob Cosgrove alternately leading did finish the climb from bottom to top. We arrived on the summit at exactly 7 P.M. Saturday, just at nightfall.

The climb is really severe, maximum fifth class. The leads are long and exposed with not much opportunity for piton protection. In my opinion, the climb offers more variety in climbing technique than any single climb I have yet seen. Skill in route finding is essential, together with the climbing techniques that a rock climber can only gain through several years of experience. The route starts on the lower side of the nose where the main nose buttress joins a wooded ridge which continues on down to the valley below. After one or two pitches of more or less difficult scrambling, one arrives at the base of the first major pitch, which is a long chimney about 120 feet high, at an angle of about seventy degrees or better. This must be done without piton protection but it is comparatively safe if the leader has had sufficient experience in chimney climbing.

Long, difficult pitches alternated with simpler problems. Just as we thought we were on "easy street" another rugged pitch would come into view. In all we used at least 50 pitons for protecting the leader. These included half a dozen angle pitons developed by the Army for the mountain troops and improved by George Harr. The angle pitons were invaluable to us in making several difficult leads safe for the leader.

ROY M. GORIN

ROCK CLIMBING IN THE DESERT

The Ajo Mountains of the Organ Pipe Cactus National Monument in southern Arizona were the subject of intensive treatment April 3-5 by Roy Gorin and Jim Bonner, accompanied by Louis Mousley of the Riverside Chapter, and National Parks Service Ranger Glen Bean. These rugged mountains rise from an elevation of 1,000-1,500 feet to a maximum of 4,800 feet in Santa Rosa Peak. Their high sheer faces culminate in ridges surmounted by vertical towers which, in many cases, form the actual peaks. The fact, that no recorded climbs of the major peaks had been made, was the basis on which National Parks Service custodian, William P. Supernaugh, suggested to the Sierra Club party, the desirability of not only making the ascents, but also placing park registers on their summits. Montezuma Peak, in the northern end of the Ajo Mountains, was the first subject. This peak rises in a series of walls and shelves to a final vertical walled summit block approximately 300 feet in height, and a little fourth class climbing, together with some scrambling, brought the party to its base. The most feasible route lies up the north corner of the east face, which here drops away vertically for some 1,500 feet. A series of open couloirs, shelves, and short, steep faces with two pitons for safety, brought the party to the summit. But woe, there was already a small cairn containing an old tobacco can with the initials K.M. and C.B. There does not appear to be any easy route up the peak, and especially no easy route down, since our party roped off one more unpromising pitch. A theory held by some is that the skeletons of the early pioneers, K.M. and C.B., lie together

with those of an unfortunate mountain sheep, somewhere at the base of the east face. The approach to Mount Diaz in the Southern Ajo Mountains opened our eyes to the possibility of fourth and sixth class travel by pick-up truck. In this maneuver, two pick-up trucks are used for cross-desert travel; one to belay the other in sandy washes, etc. On occasion direct aid may also be used. Mount Diaz proved readily climbable with an occasional fourth class pitch, and its summit was (previously) undefiled. To round out the day, Santa Rosa Peak, some 7-8 miles away (by foot) was also climbed. The ridges of the east side, rather than the formidable faces of the southwest, were chosen for the attempt, and the long, steep ascent made along a ridge surmounted by massive, prominent pinnacles. To our horror, a cairn also crowned this peak, and in fact, a U.S.G.S. cairn from 1920 and 1936. The record of these climbs is presumably still buried on somebody's desk, since it is not yet available to the National Park Service. The Ajo and other nearby mountains, including the Growlers, Dripping Springs, and Pinacates, offer a wide range of climbing and exploration possibilities for fall, winter and spring mountaineering.

JAMES BONNER

SOME NEW ASCENTS IN YOSEMITE VALLEY

Church Tower.—First ascent by the north wall, June 1, 1946, by John Salathé, DeWitt Allen, Fritz Lippmann, Anton Nelson. Start at highest talus just under overhanging summit block and work up to left toward northeast ridge. Proceed upward on east side of the north face by means of a piton ladder, or delicate turning of a rotten overhang on slings, or long and exposed class 4 open chimney. Above, the climbing is mainly class 4 and class 5 until a junction is made with the original route to the summit along the east ridge. An interesting and enjoyable rock climb.

Sentinel Rock, Northeast "Bowl".—First ascent June 12, 1948, by Anton Nelson and John Salathé. A reconnaissance of the challenging north wall of the Sentinel led to this climb. While we did not attempt the north wall on this occasion, a few impressions on its potentialities as a climb may be of interest. The west side of the "Flying Buttress" seems to be an excessively difficult way to get into the long chimney that splits the wall. When the north wall is climbed, in this writer's opinion, it will be done by a toughened, experienced team, fully equipped with climbing aids of the type used on the Lost Arrow. Approximately 3 to 5 days will be required, with a bivouac on the wall. The route in all probability will start on the east side of the "Flying Buttress," continuing directly up through small cracks to the lower end of the long chimney, and continuing in this chimney to the top. The long chimney has a challenge like that of the Lost Arrow. Its average angle is 82° and sections are missing in two or three places, probably calling for expansion bolts. The degree of difficulty, in my estimation, will be severe to extreme, classes 4, 5, and 6 (or 7!). It is the second greatest climbing challenge in America.

On this occasion we passed up the north wall as a goal and proceeded across its ledges to the east corner and its "bowl." We entered by a delicate traverse around a corner but it would not allow either protection for the second man or even communication with him. The leader consequently retreated and one long rappel enabled the party to enter the "bowl" at a lower level.

What followed was one of the most enjoyable climbs but one of the most difficult and probably the most dangerous either of us has ever experienced in Yosemite. Geologically the "bowl" seems to be the weakest point in the structure of the north side of Sentinel Rock. This is abundantly indicated by the crumbling and loose nature

of much of the rock. The leader had to exercise extreme caution in testing all chockstones and holds in general. Much debris had to be removed from overhead before the leader could proceed, all the while on delicate balance or cross pressure with barely adequate piton protection. The rock offers few opportunities for sound placement of pitons. The belayer's position on this nearly vertical climb is hazardous because of falling rocks and sand.

The route consists of vertical cracks and half-open to wide-open chimneys, starting near the middle of the "bowl" and working toward the left or east side. Extensive use of cross pressure is the key to success here. Two or 3 pitons were used for direct aid.

One emerges on top of the ridge through a needle-eye at the top of an overhanging chimney, followed by a very rotten chimney and a second needle-eye. The climb as a whole consists of a series of high-angle rotten chimneys that make the chimney on the Higher Spire seem delightfully sound, and involves approximately 600 vertical feet of high-class climbing. A variety of pitons are needed and 6 or 8 carabiners.

The treacherous and dangerous nature of this climb makes it advisable only for the experienced and cautious climber. It would be a very poor place to be benighted. Roping down is hazardous because of the danger of being struck by loose rocks. Particular warning is given concerning a large and loose chockstone at the crux of the overhanging chimney near the top of the climb. It offers the one obvious and badly needed hold but even half a man's weight will put it down upon him. The next party can pass it by continuing on cross pressure. It should then be dislodged.

ANTON NELSON

RIXON'S PINNACLE—1948

Rixon's Pinnacle in Yosemite Valley is a 400-foot remnant of an exfoliation slab against the vertical south face of the Middle Brother. First pointed out by Tom Rixon as a climbing problem, it has since been frequently examined but climbers carefully avoided its smooth faces until the last two years. In 1947 Anton Nelson ascended the west chimney over 60 feet and claimed that the first difficulty might be overcome, perhaps requiring expansion bolts, however. It appeared that the chimney was even more difficult above. John Salathé attempted the face of the "pinnacle" in the spring of 1948, and after a difficult rope traverse to get started ascended a piton ladder for a distance of about 100 feet. In descending he left a dozen pitons and half as many carabiners still in place.

My wife, Ellen, and I, made our attempt in August of 1947 at the close of a trip to the Canadian Rockies. The first pitch to a prominent tree involved a lead of over 150 feet (two climbing ropes tied together) and required about 30 pitons. An expansion bolt driven by Salathé on his attempt was passed using a large angle piton, but the entire pitch was sixth class, with only about 4 or 5 usable footholds on the entire pitch. Above the tree was the crux of the climb, a short section completely devoid of piton cracks and thus no possibility of using direct aid. A short, difficult Munsmery crack appeared climbable for a short distance but seemed to leave the leader in difficulties. No other route seemed possible, so this one was attempted. Fortunately, at the last possible desperate moment a wondrous handhold permitted the leader to climb up onto a small ledge and drive a piton. An open chimney about 30 feet high blocked progress here. The first 10 feet permitted no pitons and the possibility of finishing the climb without expansion bolts seemed slight, but the day was late so fixed ropes were installed and the climb was continued on the second day.

A block of wood was driven high in the back of the chimney to provide a direct aid step which permitted driving a wide angle piton 8 feet higher. Easier sixth-class climbing extended to the next belay spot 90 feet above the tree and on to the second tree 60 feet beyond. Above this one direct-aid piton and several fifth-class pitches brought us to the summit at 6 P.M.

This climb was very similar in difficulty to the Lost Arrow Chimney, but fortunately much shorter. Probably 60 pitons were driven in making the ascent. Wide angle pitons were found essential in several places, but even the indiscriminate use of pitons could not make this climb easy. A one-day ascent might be possible with an early start and a fast team of two climbers, but this would not be easily accomplished.

CHARLES WILTS

A NEW ROUTE ON THE LOWER SPIRE

The Lower Cathedral Spire has always been one of my favorite climbs, particularly since some time in 1942 when I made the first successful lead of the "flake" without the use of rope slings or lassoing the horn of the "flake." With me on that trip were Chuck Wilts and Dorothy Markwad.

When we heard of the accident which occurred to the pitch in the loss of the first piton flake, a group of us wanted to go up to try the climb again. Our first opportunity came on Memorial Day this year.

The weather looked threatening when we reached Yosemite. No one in our group was too anxious to go on a long climb the first day, so we all agreed on the Lower Spire. I led the first rope with Paul Estes second, and Jerry Ganapole and Raffi Bedayn made up the second rope.

Several other climbers had a four hour start on us, and we had anticipated that they would be out of the way when we reached the ledge below the "flake." However, when Paul and I arrived there, the ledge and the flake pitch looked like the corner of Fourth and Broadway in Los Angeles at high noon.

Since we were considerably ahead of the second rope, Paul and I spent some time looking for other possible routes. Finally it appeared that the fresh air traverse at the extreme edge of the ledge might go.

We spent some time in figuring out how to approach the lead with at least some protection and then Jerry and Raffi arrived. Raffi, being also a family man, put on a second belay for me to be on the safer side.

In order to get the first piton in, it is necessary to go down facing in over the end of the ledge, and leaning way back with the belayer holding you there. It is barely possible to reach the cliff wall on the right and place two pitons, one above the other. After threading the rope through a sling in these pitons, you forget everything, wife, and kids included, and cut loose. You traverse about 15 to 20 feet to the right on small holds above a terrific overhanging wall. After you make this traverse to a little shelf about 6 inches wide and a foot or so long, the route goes straight up, with the climbing almost perpendicular.

Fortunately, there are plenty of holds and piton cracks, for the exposure is really something to think about. There are two long leads, then the route joins the old one and the finish is quite easy.

Approximately 15 to 20 pitons were used for protecting the leader.

ROY GORIN

FIRST ASCENT OF THE HIGHER CATHEDRAL SPIRE BY THE SOUTH FACE

In the history of the Higher Spire the twenty-seventh ascent was the first to differ significantly in route from the original climb. The Spire was first ascended in 1934 by Richard Leonard, Bestor Robinson, and Jules Eichorn. Although the summit block had been climbed by four different routes and the entire climb accomplished by fifth class technique, no means of ascent had been found on any of the remaining faces.

On May 30, 1948, Ian McKinlay and I by a stroke of luck in attempting to find an easier way from First Base to Second Base, discovered a route to a large flake directly over and 225 feet above the First Base ledge. By ascending the steep talus notch between the flake and the wall, I found the ledge leading to the base of the Rotten Chimney. From the base of the talus notch and 15 feet to the right (east) a vertical crack leads upward for some 80 feet on the 80° wall which tapers off to a more friendly angle in its upper portions. Above this vertical crack the climb to the summit block looked much more encouraging. Unfortunately our supply of hardware was inadequate to attempt such an extended lead. We continued on to the summit via the regular route.

Convinced that the new route would go, I returned on the 18th of August with William Hoyt, my twin brother, and Allen Steck. We started at 5:30 A.M. with a good selection of angle pitons, wafers, and carabiners. From First Base the route leads to the right in a delicate traverse and then upward in a broken chimney and over a bulging chockstone. Around farther to the right is a thin ledge with an overhanging wall above, ending in a short open chimney. The ledge provides an easy route to a welcome platform 25 feet above. From the platform a crack requiring direct aid leads upward to the left, ending below the flake in the talus notch. Again we were in a position to tackle the crucial pitch of the direct route on the south face. Eighty feet of the vertical crack required 25 pitons varying from the widest angle we had to an uncomfortably thin wafer. At the top of the crack a traverse on tension enabled the leader to reach a break in the vertical face. This ended in a sloping shelf which was satisfactory for an upper belay. From here a short closed chimney led to another ledge and thence up a 45° trough in a good fourth class pitch to the base of the summit block. At 8:30 P.M. we huddled happily around the register after eleven hours of continuous climbing. The ascent had required 41 pitons, 34 of which were for direct aid. All 41 pitons were removed. After a brief lunch we roped down in brilliant moonlight and continued down to the comfort and security of the valley floor.

FLETCHER E. HOYT

Reviews

OUR PLUNDERED PLANET. By Fairfield Osborn. Little Brown & Co., Boston, 1948. 201 pages.

This book renders invaluable service to the cause of conservation by presenting its story in a way that has deep meaning for both the informed and the uninformed.

Fairfield Osborn succeeds in his great purpose: to show that man is a part of the scheme of nature; that his existence stems only from the bounty of the soil; and that if he is to survive, he must work with nature and not in defiance of her. He presents this picture in terms of biology, ecology, sociology, medicine, religion, and of course, history and geography. He gives it to us, not in dry and pedantic language, as this list may suggest, but informally, with the simplicity and cogency characteristic of one who has thought so deeply that he has discovered the truly basic relationship of his subject to the general scope of man's knowledge.

Such an approach to the problem of conservation helps the informed conservationist to comprehend the problem fully, and thus make his activities as significant as possible. At the same time, the book is entirely palatable to those who have never thought about conservation. In presenting the problem as one which touches on every phase of man's existence and culture, it cannot fail to impress people who think along widely divergent lines and thus make many new conservationists.

Part I of the book is a discussion of man's place in nature. Its chief point is that nature is cyclical; that is, animal and plant life springs from the earth and returns to the earth its waste and its dead. Man, in modern civilization, has broken the cycle by sending products of the land to be consumed to the last particle in cities. Not realizing this fundamental weakness of urban civilization, man does not compensate for it, but instead, heaps abuse on abuse, always taking more from nature than he returns.

Part II describes how man has abused his priceless gift of natural resources on every continent down through history. Osborn says that the only two spots on the globe where the soil has not deteriorated are Japan and Lombardy. Russia is richer in arable land than the United States, mainly because she lacks rainfall. On the other hand, Western Europe is very fortunate climatically and has on the whole, been far better cared for through the ages than other lands. We are told that abuse of the soil was responsible for the burying of the ancient cities of Asia Minor under the sands. It is no comfort to read that the United States is committing the same type of errors today—deforestation, overgrazing, "mining" of the soil. We must battle against the natural reluctance of a civilization to visualize its own extinction, and must realize that extinction can happen to us. Man's inventive genius is not equal to recreating what he has destroyed. He can only conserve.

The book is more than a treatise on conservation. It is a book of fundamentals which should become a part of the consciousness of all who have any influence guiding the destinies of people and nations.

JEAN S. BARNARD

MOUNTAINEERING IN SCOTLAND. By W. H. Murray. J. M. Dent & Sons, London, 1947. xii + 252 pages, 32 photographs, maps, diagrams.

To those who have felt the delightful roughness of the Skye Gabbro, or have struggled in Ben Nevis's snow-filled gullies, Mr. Murray's book brings back many vivid

memories, and a nostalgic longing for the Scottish mountains. For the reader unfamiliar with these scenes, it is just another climber's diary, rendered a little incomprehensible by the use of Celtic names which have to be heard before they can be pronounced.

The three main climbing areas of Scotland—the Cuillins in Skye, Glencoe, and Ben Nevis—are well covered, and in addition, there are a few accounts of ascents on the less-easily accessible cliffs of the Cairngorms.

The American reader will be struck by the proportion of the book devoted to winter climbing. It must be remembered that only in winter are near alpine conditions to be found on the 4,000-foot peaks of Scotland. Winter days in the mountains are disconcertingly short, and so we find an alarming number of accounts of benighted expeditions and even excursions on which several hours of moderately difficult rock climbing by flashlights is planned beforehand.

This book is written in a rather more dramatic vein than is usual in mountaineering journal accounts of climbs. A few descriptions verge on "The vertical, holdless, ice-covered wall was ascended without pitons" variety, where Mr. Murray first describes the impossible and then climbs it. In general, however, the book is well-written and portrays vividly a brand of mountaineering almost unique to the British Isles.

C. REID

ON ROCK AND ICE. Mountaineering in Photographs. By André Roch. Foreword by Frank S. Smythe. A. & C. Black, London, 1947. 30 pages, 81 photographs. Price, 21s.

In this slim book, André Roch, a mountaineer of international reputation, has gathered 81 photographs of the Alps, written informative legends for each, and prefaced the whole with a short exposition of his personal attitude toward serious and technical mountaineering. Such is the book in outline.

We may quarrel or agree with Roch's sentiments about the delights of overcoming dangers and the enjoyment to be found in straining nerves and muscles on difficult ascents, for these are matters of personal taste; but with regard to the pictures he has collected, we can only admire them and respect the skill of the mountaineers who took them.

Of the 81 plates, 39 were taken by Mr. Roch himself; the rest are by noted Alpine amateurs and professionals. Most of the pictures were exposed on actual climbs, and show, as well as any pictures I've seen, the tense quality of a lead on difficult rock as well as the incomparable Alpine scenery. The pictures, distributed between subjects in the Mont Blanc chain and the various Swiss ranges, cover both mountaineering and specialized rock climbing.

The pictures are uniformly excellent and appear all the more remarkable since many of them were taken on routes of the greatest difficulty. To take a fine photograph is difficult at best; to take an extraordinarily good one while ascending such a route as the North Face of the Droites is a sufficient recommendation of this book for all lovers of the mountain scene.

A. W. BAXTER, JR.

MOUNT EVEREST, 1938. By H. W. Tilman. Cambridge University Press, 1948. x + 159 pages, illustrated, maps. Price, \$3.75.

The British party, led by Mr. Tilman, made the fifth attempt to climb the highest peak in the world. Like the others, the attempt failed in the sense that no one reached

the summit and returned; but as Mr. Tilman remarks in his introduction, the methods used in 1938 were a sufficient departure from those of previous expeditions to merit careful analysis and discussion.

Aside from Tilman's high standard of writing, and the intrinsic interest of Mount Everest, the book is essentially an attempt to vindicate the use of a small and unencumbered mountaineering party as the most efficient way of climbing the mountain. E. E. Shipton and Tilman did wonders with a small party in the Karakorum and the burden of this book is a plea for the extension of light party tactics on Everest and the elimination of vast and expensive expeditions.

In the supplement, Mr. N. E. Odell, one of the party, criticizes the size and lightness of the 1938 party, but, on the whole, the argument of smaller parties seems stronger. This is encouraging to those who feel peaks should be climbed for fun and that fun can best be had in a mountaineering team and not in a small army.

Excellent, although unimaginative, photographs and technical discussion of the geology and glaciology round out Tilman's story. The book is valuable as a reference work as well as a competently-written chapter in the story of man's effort to climb Everest.

A. W. BAXTER, JR.

MOUNTAIN CLIMBING GUIDE TO THE GRAND TETONS. By Henry Coulter and Merrill McLane. Dartmouth Mountaineering Club, Hanover, 1947. Price, \$2.50.

For a concise guide to a mountain region, this $\frac{1}{2} \times 4 \times 6\frac{3}{4}$ " manual covers its subject well. It will fit into the standard shirt pocket, and its flexible construction conforms to the wearer's physical and mental dimensions. Of course the lack of a hold-by-hold description may cause dissension by those who feel that they should be led up a mountain by the hand. The authors are of the opinion, and for a good reason, that this minute description tends to destroy one of the fundamental precepts of climbing, good route finding. In lieu of this, they put him on the mountain of his choice and gave him good general instructions on how to attain the summit.

The first portion of the guide is excellent. It is devoted to a description of the range, its nature, weather and climbing history. Their advice on equipment is good, but their warning on the use of old sling rope and pitons is not strong enough. They should print some obituaries. Their system of grading the climbs points out, again, the need of a unified system throughout the country. The authors say that they are "well aware of the shortcomings of all systems of grading climbs." They must have overlooked a number of choices.

ROBIN HANSEN

AGAIN SWITZERLAND. By Frank S. Smythe. Hodder & Stoughton, London, 1947. This is a delightful account of Frank Smythe's postwar visit to Switzerland in the spring of 1946. It is a simple and personal story of two friends meeting after a seven-year absence. Smythe had the experience of rediscovery akin to those of us who returned to our own hills after the war.

The book is an intimate guide to such villages as Adelboden and Kippel as well as to the ski-mountainaineering terrain around them. And what terrain! Smythe's superlative photographs of mountain scenes are perhaps, the equal of the text in bringing out the glory of the mountains and the delights to be found among them. It is not just a story of high-altitude ski touring, or just an account of a fast trip to

Switzerland, but a harmonious blending of the two by a man who, with his camera, is well suited for the job and whose obvious pleasure in this task can be shared by the reader in every chapter.

Not the least interesting section of the book is a supplement on seldom-exported Swiss wines. In this appendix wines are listed by the areas in which they are grown, with recommendations about their respective excellence.

For an evening of enjoyable, albeit vicarious, mountaineering, *Again Switzerland* is a good bet.

A. W. BAXTER, JR.

FIRE. A novel by George R. Stewart. Random House, New York, 1947. Price, \$3.50. If all the pages of *Fire* carried the sweep and drama of the closing chapters, this would have been a memorable contribution to the cause of conservation. As it stands indeed, it has great value in helping to promote understanding of a forest fire's impact on a community—even, as we are too late beginning to discern, on the whole life of a nation. Unhappily though, after a vivid opening, the middle part of the book drags. The multiplicity of characters, animal and human (the latter all too seldom emerging as individuals), instead of illuminating the ever widening circles affected by the fire is merely confusing. Even the growth of the Spitcat fire in these middle passages, reads too much like an accumulation of data—the stuff that theses are built on rather than novels. A few scenes stand out in memory in vivid contrast: the panic among the "pogy" fighters that lost the battle on Reverse Ridge; Bart's sudden crumpling when the loss of his beloved glen first comes home to him. In the power of these and similar moments one doubly regrets that the book should be so slowly paced that the indifferent reader, one not already converted to the cause of fire prevention, may well weary of it before the whole story is told.

M. R. P.

YOSEMITE, THE BIG TREES, AND THE HIGH SIERRA. By Francis P. Farquhar. University of California Press, Berkeley, 1948. xi + 104 pages, illustrated. Price \$7.50.

We knew that this would be a thorough job and a scholarly one, because that is the sort of job Francis Farquhar does; we suspected that it would be an interesting one. But we felt that of necessity such a bibliography would have a limited appeal. However, it did not take the reading of more than the notes on the first title to demonstrate that this is an extraordinarily fascinating "selective bibliography," which cannot help but have a much wider audience than one might expect a bibliography to have. It is specialized—yes—but with such variety as to divert many more than just collectors.

The author explains in the preface that his first intention was merely to describe the more important printed source materials for a history of Yosemite, the Big Trees, and the High Sierra. It then seemed desirable to supplement the bibliographical descriptions with notes on the origin of the respective books and pamphlets, and to comment on the significant portions of their contents. All this additional material is what makes the book so interesting, and so much more than a cut-and-dried bibliography, however useful that might have been for writer, librarian, or collector. The choice of twenty-five titles was based on their rarity and unusual character, their originality, and their contribution to the knowledge of the subject, from Zenas Leonard's *Narrative* of 1829, Hutchings's *Scenes of Wonder and Curiosity*, Whitney's *Yosemite Book*, Clarence King's *Mountaineering in the Sierra Nevada*,

Gordon-Cummings' *Granite Crags*, John Muir, Stewart Edward White, and others, to the Japanese *Conquest of Mount Whitney* in 1931, and the reports of the superintendent of Sequoia National Park, 1891-1915. The result is most assuredly "a compendium of information designed to be helpful to those who desire to write about the subjects covered and to serve as a useful reference book for librarians and collectors," but it is also much more.

The noncollector can read of the "Great California Tree" which was cut down and exhibited in the Racket Court of the Union Club in New York in 1854, with almost as much interest as the collector who possesses the pamphlet describing this "Great Tree, so recently felled upon the Sierra Nevada." At this moment when we are concerned over the Calaveras trees we read with special interest, and a good deal of horror, of other early desecrations. The collector or student will be delighted by the careful descriptions of the four editions of Zenas Leonard's narrative, and the noncollector will be pleased to learn that Zenas Leonard was a member of the Walker expedition, and with that group of the first white men to look upon Yosemite Valley and the Big Trees. It would seem that only students or conservationist researchers would find the early reports of the Yosemite Commissioners, or of the Superintendents of Yosemite National Park of any great concern. But again, the ordinary reader will be interested in the notes on these reports, which give the story of the beginning of Yosemite National Park, the development of some of the policies of our present national park system, the familiar struggles of private gain against public interest, and the final passing of the Yosemite from the hands of the State Commissioners to the Federal Government.

We could say more, but it would be better for you to dip into this bibliography for yourself. To read it might easily turn the noncollector into a collector, when he finds how vividly the past of his favorite parts of the world can be brought to life by old records.

It is not only a scholarly piece of work, but is also fascinating and lively reading, attractively printed by the University of California Press, and illustrated with interesting gravure reproductions of photographs, title pages, and covers.

H. T. P.

TRACKS AND TRAILCRAFT. By Ellsworth Jaeger. The Macmillan Company, New York, 1948. vii + 381 pages, illustrated. Price \$3.95.

Readers of Ellsworth Jaeger's other books know the wealth of interesting information and practical knowledge they contain. *Tracks and Trailcraft* is no exception. Beginning with fossil tracks and some of the deductions to be made from them, Jaeger is off to a graphic start to show how "a good tracker can follow Mother Nature's trail from the very beginning of time down through the ages." From Indians and their tracking he goes on to the tracks of familiar domestic animals, of animals of the field and forest, and of the jungle and zoo, bird tracks, reptilian tracks, and even the tracks of snails, crabs, and insects. Tracks may tell us all kinds of things if we will look and learn, and the author reveals a profusion of fascinating trailcraft lore.

The clear and sometimes amusing pen-and-ink sketches of the animals and their tracks are on almost every page—there are 203 plates—and we cannot neglect to mention also the gently humorous animal vignettes heading each chapter, as they are quite delightful. The last two chapters describe how to reproduce tracks by

making casts of various kinds, and a number of tracking games, which are not only fun, but at the same time develop the senses that must be used in real tracking and trailing.

H. T. P.

MAMMALS OF LAKE TAHOE. By Robert T. Orr. *California Academy of Sciences, San Francisco, 1949. 127 pages, 36 drawings. Price \$4.00.*

Did you know that some shrews can walk on the water's surface—or that trout sometimes eat bats? Many more interesting and startling facts are to be found in the wealth of information packed into Robert T. Orr's latest book dealing with the mammals of the high Sierra Nevada. For, as the author points out, most of the mammals discussed are not restricted to the Lake Tahoe region, as the title might indicate, but range widely throughout the Sierra Nevada and other western mountains.

Written as a field book for the lay naturalist, information regarding the home, family life, food, voices, and habits of fifty-three mammals is here made available in accurate, succinct form. Of particular interest to conservation-minded readers are the frequent references to the natural relationships of mammals and their enemies and to the many occasions in which man, largely for monetary reasons, has upset that balance. Owing to trapping, fishers are now very rare and badgers found only occasionally, the latter falling easy victim to poisoned bait set out for coyotes.

Orr has made this book more than just a series of species accounts. Following the introduction, he gives a brief history and geologic description of the Lake Tahoe region. A clear explanation of the way in which animals are classified and the groups into which mammals are divided forms a basis for a better understanding of the key and the arrangement of the species accounts which follow. Technical terms are explained in the glossary and a list of references provides additional reading for those wishing to delve deeper.

The outstanding animal illustrations of George and Patricia Mattson have been seen many times and their many drawings add greatly to the attractiveness of this book, a welcome addition to the library of all who are interested in the wildlife of the Sierra Nevada.

JOANNE TAYLOR

HIGH TRAIL. By Vivian Breck. *Doubleday & Company, Garden City, New York, 1948. 214 pages. Price \$2.50.*

I was "pleased as punch" when asked if I would review this book, because it gave me a very good excuse to take time out to re-read it. It isn't often that I feel that way about a novel. Usually, once read it's given its place on the shelf and taken down only to be dusted or to be lent to a sick friend.

Vivian Breck's characters are people we know. As the story unfolds we can hear them say the things they say, and, best of all, she has them acting the way well-trained mountain people act. She has packed, no, crammed the pages with excellent mountaineering, camping and first-aid technique, meanwhile developing a first-rate love story. David Starling, one of the main characters, is an ardent conservationist and through his lips the author gives voice to the problem of protecting our diminishing wilderness so convincingly that the reader is waving the banner along with Star by the end of the story.

The jacket describes the novel as one for teen-agers, and Vivian Breckenfeld says she wrote it for that age group, but I'm convinced the interest span should be enlarged to include anyone who can read.

High Trail has adventure, suspense, pathos, sparkling humor, fear, romance, a fine description of an electrical storm on Mount Whitney, where most of the action takes place, plus a tense situation on the east side of Whitney which is solved by rock-climbing knowledge.

DORIS F. LEONARD

THE INVERTED MOUNTAINS: CANYONS OF THE WEST. Edited by Roderick Peattie. Contributors: Weldon F. Heald, Edwin D. McKee, Harold S. Colton. The Vanguard Press, New York. 1948. x + 390 pages, illus. Price, \$5.

The concept of the Grand Canyon as an "inverted mountain" offers to the inventive mind many opportunities of exploitation. It was Weldon Heald's plan some time ago to write such a book, and if he had carried it out it would have been a good one. The idea was to present the salient points of a mountain range in reverse. The approach would lead one downward instead of upward. The culmination would be, not the crossing of the bergschrund or the escalade on the final rocks, but the penetration of the inner gorges of the canyons and the tossing boat ride through the rapids of the great river that, in the inverted sense, forms the crest of the range. At some point along the way, however, Weldon got off the trail, and, although the book that was to be his is now published, he appears merely as a "contributor"—in good company, to be sure—while on the title page and cover appears the name of an editor who obviously has had very little to do with the book. It is apparent that the "inverted mountain" idea has fallen a victim of the "series with famous editor" scheme, which tends to produce great disparity in content in monotonously uniform binding.

In the present instance two potentially good books have been made one, in name only. Weldon Heald has "contributed" six of the twelve chapters; Edwin D. McKee, five; and Dr. Harold S. Colton, one. Dr. Colton's chapter on "Indian Life—Past and Present," as might be expected, is a concise and authoritative statement about the Hopi, the Navajo, and other tribes of the northern Arizona plateau country. Edwin McKee, with the skill born of many years of explaining the subjects to Grand Canyon visitors and to students, has provided an up-to-date survey of the geomorphology, the story of the fossils, trailside natural history, the extent of trails in the canyon country, and, best of all, a chapter on the control of life by environment. These are admirable guide-book chapters, but they have little to do with the "inverted mountain" concept, nor is there much evidence that they were planned for integration with the chapters written by Heald, a fault not of the contributors but of the editor.

Heald's chapters include "Canyon Preview," broadly descriptive of the region, in which the countersunk mountain idea is touched upon in one paragraph; "Three Hundred Years of Spain" and "The Americans Come," in which the accepted historical form is followed; "The Colorado River," in which the river expeditions from Powell's to those of Nevills are summarized with rather more discrimination than is ordinarily given to them; and, finally, the two chapters which alone make this book worth while for those who have already visited the country and are familiar with most of the rest of the contents—"Riding Grand Canyon Rapids" and "The Canyon Wilderness." In the latter chapters Heald is writing of his own experiences. He was with Norman Nevills on the Grand Canyon run of 1941 and has utilized Nevills's diary of that trip most effectively. It is the finest kind of direct river lore and is a certain choice for inclusion in any future Grand Canyon

anthology. Heald's own writing is at its best in the last of his chapters, in which he tells of his journey in company with Randall Henderson from Flagstaff, through Monument Valley, to Mexican Hat, and the boat trip down the San Juan River to the Colorado, the side trip to Rainbow Bridge, and the concluding voyage through Glen Canyon to Lee's Ferry. Those of us who were with him on that trip can testify to the reliability as well as to the felicity of his account—except that the coed's "record" of seven swims was far surpassed by the photographer who may be identified through the reference to the climb of Rainbow Bridge as a Sierra Club member and mother of four. Heald is more reliable than McKee in respect to Glen Canyon. McKee, in perhaps his only slip, speaks of the Colorado River "where it rushes through Glen Canyon," while Heald's four boats "floated lazily down the broad river through Glen Canyon."

The book is illustrated by a number of fine photographs and it is a shame that the photographers' names are not given. There is an acknowledgment at the beginning of the book, but it is of the "by courtesy of" type and one does not even know whether the pictures furnished by courtesy of McKee and Heald are their own or those of friends, while the courtesy of the National Park Service and the Union Pacific Railroad is rendered a discourtesy on the part of the publisher through failure to give credit where it is due.

FRANCIS P. FARQUHAR

SKIING ALLAIS TECHNIQUE. By Robert Albouy. *The Craftsman Press, Inc., Seattle.* 47 pages. Price \$2.00.

This little book contains seven chapters treating the subjects of ski history, equipment, laws of balance, fundamentals of the Allais technique, ski school, racing, and mountaineering. The coverage of such a wide range of subjects in 47 pages is of course quite cursory. The most interesting parts of the book are the chapters treating the Allais technique. The author presents, with numerous diagrams and sketches, a careful analysis of the Allais style of parallel turn. A brief description is provided for the uninitiated. The beginner is taught to ski with a parallel christiania, rigidly avoiding a stem position, which is considered a hindrance to good skiing. The essential movements of the turn are: (1) appel (counter rotation) and sideslip, (2) forward lean, rotation and "clutch," and (3) the follow through. The author assigns the word "clutch" to the transmittal of the body rotation to the skis. The forward lean is necessary to unweight the tails of the skis so that they may skid around easily during the turn. On difficult snow or steep slopes the "ruade" or horse kick is done at this point. This spectacular movement is described not as a jump but one in which the tails of the skis are lifted off the surface of the snow by pulling the legs up toward the body, which maintains the same distance from the slope throughout the maneuver. The book is to be recommended to those who would understand the Allais technique; however, the printed word is inadequate and cannot convey by dissection into parts an ability which is the result of a highly coordinated movement and at best becomes second nature. The author remarks that the highest achievement of skiing is in the domain of ski-mountaineering, something that ski-touring enthusiasts have long maintained.

ALAN R. STILES

HOW TO SKI BY THE FRENCH METHOD. EMILE ALLAIS' TECHNIC.
Flèche Publications, Paris. 111 pages. Price \$6.00.

The text of this book is modest and consists of a foreword by Roger Frison-Roche

which rather poetically treats the development of Allais into a skier and gives a brief description of the evolution of the new technique by its originator. However, the photographs which were taken and arranged by Pierre Boucher, make up the greater part of this beautifully illustrated book. Allais succinctly divides his style into the aspects of downhill running, sideslipping, christiania and snowplough turns, and jumping, all of which are amply illustrated. The arrangements of the photographs are excellent, for the impression is given of the speed and dynamic balance which is so essential in all skiing. The book, truly a work of art, is recommended as a valuable addition to the skier's library; but it is probably a book for the more expert skier, as it is difficult to see how the neophyte or even the average skier can put these principles into practice.

ALAN R. STILES

CALIFORNIA PLACE NAMES: A GEOGRAPHICAL DICTIONARY. By Erwin G. Gudde. University of California Press. Berkeley and Los Angeles, 1949. xxviii + 431 pages. Price \$10.00.

The California Centennials of 1948, 1949, and 1950 are being celebrated in various ways, but perhaps the greatest single contribution is a compilation on the origin and meaning of California geographical names. This large (8 by 10¾ inches) volume is a dictionary not of places, but of words used to identify places, although incidentally there is a lot of history, geography, folklore, and bibliography included.

The Foreword is written by George R. Stewart, who tells of the origin of the compilation as a WPA project, later to be proposed as a nation-wide survey. Stewart became Chairman of the Advisory Committee for this volume. It is his hope that the *California Place Names* will be a model for future works on other states. There is a brief Preface by Erwin G. Gudde, followed by extensive acknowledgements. It should be noted that members of the Sierra Club had a prominent, if not dominant part, in the work. Dorothy H. Huggins is given credit as the research assistant who "dug deep into the treasures of the Bancroft Library and unearthed valuable and unknown material." Francis Farquhar was an active member of the Advisory Committee and he is cited as reference more than any other one authority. Because of Francis Farquhar, the High Sierra is covered more accurately and more fully than other sections of the state. In the list of sponsors it is fitting that William E. Colby represents the Sierra Club.

In the Introduction Dr. Gudde tells of the widespread study of place names in Europe and gives a summary of the chronological growth and variety of California nomenclature. Names of most physical features consist of a specific element and a generic element. The specific element is the actual name given; Lyell, Benson, Yosemite. The generic element designates the feature: Mountain, Lake, National Park. The names are, with a few exceptions, listed alphabetically by specific name. Especial attention is given to unusual or seldom used generic names.

The main section begins with Abalone (a large mollusk which gives its name to about ten points and coves along the coast) and ends some 796 columns later with Zurich (an Inyo County narrow-gauge railroad station; Alpine-like scenery a few miles west suggested the use of the name of the Swiss city).

The place names included are geographical entities, i.e., city or railroad station, a lake or river, a mountain range or a hill, a cape or an island. Recurring names have been treated in summary. For example, although some two hundred physical features in the state bear some form of the name Pine, only a relatively short paragraph is

devoted to this word. An important inclusion is all the names of Spanish and Mexican land grants based on the unpublished J. N. Bowman Index in the Bancroft Library. The place names are identified by county and for many the source of information is given.

Elizabeth is the most popular given name; the Devil figures in some 150 to 200 topographic features; and Bear is used in some 500 names. The only Indian generic geographical term to survive is Bally, which means mountain and is used in various forms. Indian and Spanish names survive to a remarkable extent throughout the state.

The last section of *California Place Names* is a combination Glossary and Bibliography. Of especial interest is the extensive list of County histories. In the Bibliography, credit is given to Will C. Barnes for writing one of the best of the previous state surveys, *Arizona Place Names*. T. S. Palmer's *Place Names of the Death Valley Region* was received too late for inclusion. The most important published sources are the writings of Farquhar, Kroeber, and Wagner, but of greatest value were the manuscript sources in the Bancroft Library.

Phil Townsend Hanna's *Dictionary of California Land Names* was prepared simultaneously and is a very excellent work although not so extensive or detailed as that of Professor Gudde and his staff. However, a comparison shows that Hanna includes some information, especially on obsolete names, which are not in the larger book.

Erwin Gudde estimates that there are more than 150,000 place names in California, not counting streets within cities and towns. Of this number, Gudde's text covers approximately 6,000 individual items and several hundred items in which frequently recurring folk names are summarized. This suggests the need for more localized place-name books on the county or area level. Finally, it would seem desirable for the Sierra Club to issue a new edition of Francis Farquhar's *Place Names of the High Sierra*.

GLEN DAWSON

ROAD TO SURVIVAL. By William Vogt. William Sloane Associates, New York, 1948. 335 pages. Price, \$4.00.

While the problem of conservation of natural resources is a familiar one to most of us, Mr. Vogt, in *Road to Survival*, acquaints us with it on a global scale.

Man is dependent entirely, directly or indirectly, on plant life; therefore, the amount of available land suitable for agricultural purposes determines the amount of food that can be produced in order to sustain him and provide him a given standard of living. All land has a characteristic carrying capacity which will remain fairly constant, provided it is handled on a sustained-yield basis under the same technological conditions. If, however, land is exploited or "mined," it will soon become prey to erosional processes and soil impoverishment, causing a general lowering of water levels. Thus it will be well started toward a self-accelerating rate of destruction. The result, a lowering of land productivity, has already occurred in many areas of the world.

The prevalent belief that unlimited and as yet untapped possibilities lie in the development of tropical regions is rudely shattered by Mr. Vogt, who, as Chief of the Conservation Section of the Pan-American Union, should be aptly qualified to write with authority on this subject.

In the face of a depletion of global land resources, population growth has steadily

increased and created additional demand for agricultural products. As Vogt points out, if the unfavorable balance is allowed to continue—and population experts predict it will—something must be done to reduce population pressures or to alter radically many of the current agricultural processes.

Unless action is taken immediately, through methods of birth control and intensive global conservation practices, unless man immediately learns to come to terms with his environment, a drastic shortage of food supplies is predicted by Vogt within one to two generations.

Already required reading in many universities, it has aroused much comment and was recently selected as one of the ten books which most "progressively influenced American thought in the year 1948."

ALFRED SCHMITZ

YOSEMITE AND THE SIERRA NEVADA. Photographs by Ansel Adams; Selections from the Works of John Muir, Edited by Charlotte E. Mauk. Houghton Mifflin Company, Boston, 1948. xxii + 134 pages. Price, \$6.00.

To study this beautifully printed volume is to come as close as one may to a trip into the Yosemite Sierra with Muir to guide and Adams to record for us in recollections that will not fade, the scenes and the emotions they produced. Miss Mauk, herself a lifelong lover of the mountains and like Adams, one of Muir's choice family of disciples, has chosen the passages that form the text, with rare discrimination. Many of them are from *My First Summer in the Sierra*. Muir was then a young man. He was seeing everything for the first time, with all the vigor and the sensitivity of youth. In the book we go with him, across the flower-decked Central Valley in spring; up through the foothills; into the firs and pines. With him we reach the rim of the Valley, with its profound heights and depths. Finally we win to the thrilling wilderness of the High Sierra. From the passages chosen one quickly senses the wholly religious exaltation which Muir experienced as the lovely scenes unfolded and day succeeded shining day. Dull indeed must be the reader who does not catch a little of the exaltation and the ecstasy which Muir found in these scenes and which Adams has so perfectly caught.

In the second half of the volume we too can see what Muir saw—the limitless distance; the unbelievable heights; the forms, the texture and the mood. Ansel Adams has captured them with the skill of the master craftsman and the sensitive perception of the artist. Adams too is a lifelong lover of the mountains. Like Muir, he lives constantly with them; knows them as one knows his home. From his twenty years of devoted recordings of the mountain scenes, these sixty-four superb portraits were selected. Their range is wide. They capture many moods. They present scenes of great distance, or grandeur, or tremendous elemental force. And they bring us glimpses of fragile beauty, the detail of texture, light and shade—all that goes to make up this realm of beauty which Muir called the Range of Light. As no mountaineer has surpassed Muir in his gift of seeing and imparting to his readers his own rich emotions, so no artist with the camera has surpassed Adams in his ability to perceive and fix for all of us the exquisite quality of the Yosemite scene—unchanging and yet never the same. Here indeed, in this volume, we have a synthesis of what these two expressive arts can create when combined by two masters.

Every lover of the mountains will wish to own this book. He will keep it handy on the table, or at his bedside, for frequent use. To it he will return many times to recapture some of the ecstasy that he too has felt as he wandered through this in-

comparable wilderness. Every person who plans or hopes to visit Yosemite should read and study it. His pilgrimage will be the richer for it. And when he has made the journey, he will read it eagerly again. He will the better understand what a mountain wilderness is; why the wilderness lover fights desperately to save it from change; why it is precious beyond appraisal. He will understand why Muir and Adams and Mauk and many others have dedicated their lives to its preservation—for those who come and who also will thrill to its unspoiled beauty.

H. B.

THE SPLENDID HILLS: THE LIFE AND PHOTOGRAPHS OF VITTORIO SELLA, 1859-1943. By Ronald Clark. Phoenix House, London. 1948. x + 118 pages, including 3 portraits and 80 pages of plates. Price, 35s.

It is a pleasure to review a book whose author refers to the *Sierra Club Bulletin* as "that model of all mountain periodicals." It is doubly a pleasure because the book contains more than eighty large reproductions of the photographs that Vittorio Sella took in the Alps, in the Caucasus, in the Himalaya and the Karakoram, in Alaska and in East Africa. The plates are halftones and are well reproduced in spite of the rather poor coated paper, probably all the publisher could obtain. The page is large enough ($8\frac{3}{4}$ by $11\frac{1}{4}$ inches) to allow clear detail and good display. As for the photographs themselves, they are simply as good as any ever done in the mountains. Ansel Adams, quoted on the dust jacket, says, "Sella has brought to us not only the facts and forms of the far-off splendours of the world, but the essence of experience which finds a spiritual response in the inner recesses of our mind and heart."

The author, a British war correspondent, selected the pictures from Sella's photographic library in Biella. He sacrificed two Alpine holidays to the writing of the text; this, fortunately, is a short and plain record of Sella's life: the development of his photographic business, his negotiations with English dealers, his participation in the great expeditions led by the Duke of the Abruzzi.

The book will make a fine gift for yourself or for anyone who has the mountains in his head.

A. F.

-
- A Rich Source of Sierra Adventure, History, Photography, and Science ●

BACK ISSUES OF THE

Sierra Club Bulletin

Back numbers contain 80-160 pp., well illustrated with 16-32 plates, paper bound. Prices, based on the number of copies on hand:

1893-1906	*	1921, 24, 30, 31, 35, 36, 39 . . .	\$2.00
1914, 1922, 1923	\$5.00†	1938, 41, 45-49	1.00
Jan. 1913, 1928, 1937	3.00†	1915-20, 25-27, 29, 32-34, 40, 42-44 . . .	50
Jan. 1907-June 1912 (2 per year), June 1913			5/\$1.00

*A few copies available, 1902-1906†. Most others are entirely out of print, but those are to be republished by offset. Details will be announced later.

†To be sold only to persons who are completing and binding their sets.

Orders should be sent to the Secretary

